United States
Department of
Agriculture

Forest Service

Pacific Northwest
Region

**Wallowa-Whitman
National Forest**

RS-ERW-TP-036-92

Plant Associations of the Blue and Ochoco Mountains

Charles Grier Johnson, Jr.
Rodrick R. Clausnitzer.

Plant Associations of the Blue and Ochoco Mountains

by: Charles Grier Johnson, Jr.
Rodrick R. Clausnitzer

PHOTO CREDITS

Cover: Late summer view of southern Blue Mountains from Strawberry Mountain - C.G. Johnson Jr.

Title Page: View from Monument Rock toward Ironside Mountain - C.G. Johnson Jr.

Photos by F.C. Hall:
Pages 25, 29, 33, 35, 37, 49, 61, 63, 67, 69, 73, 79, 81, 83, 89, 91, 93, 99, 105, 113, 115, 119, 131, 143, 155

Photos by C.G. Johnson:
Pages 27, 31, 45, 47, 51, 53, 55, 57, 59, 65, 71, 85, 87, 97, 101, 103, 107, 109, 111, 117, 121, 125, 127, 133, 135, 137, 139, 141, 145, 151, 153

PREFACE

The Blue and Ochoco Mountains were first sampled for ecological classification purposes by Fred Hall in the 1950s and 1960s. His energy and vision resulted in the first publication of plant community types for the Region. The basic choices of where to put a plot and how to characterize the vegetation of the Blue and Ochoco Mountains was determined by Fred. We have inherited his data, added a few new plots, and designed a new classification. We'd like to express our appreciation for the assistance Fred has given in the fundamental data acquisition, the hypotheses he has formed about the types, and the pioneering pathway he forged in providing the first ecologic document for land managers on the Malheur, Ochoco, Umatilla and Wallowa-Whitman National Forests.

In the past 2 years the classification effort for the Blue and Ochoco Mountains has been a team effort. We have produced a 1990 classification review draft, a 1991 publication review draft, and finally this 1991 field guide. In producing the 2 review drafts and this final publication, we have had excellent facilitiation from Dr. Len Volland, Regional Ecologist; Chuck Ernst; Bill Gast; and our Area 3 Forest Supervisors (Bob Richmond, Mark Boche, Jim Lawrence, and Jeff Blackwood). Two formal field reviews were held with many ideas for improvement of the classification and format of the field guide resulting. The two review drafts were reproduced for field training and use by the employees of the Area with excellent help from the word processing and document reproduction units of the four National Forest Supervisors' Offices.

The placing of the numbers and words onto the printed page has evolved into an electronic computerized world where the skills of the word processing specialist directly influence the appearance and utility of the final document. We have been fortunate to have some very dedicated and extremely helpful word processing people in the production of our field guide. Our heartfelt gratitude to Vicki Medlin for her supervision and to Kathy Hottle and Paula McBroom for their wisdom and professional attitude as well as those nimble fingers!

This classification and field guide is dedicated to our families and posthumously to Terri Cummings - a dedicated Forest Service employee we lost before she could help us complete this project.

Charlie and Rod

Plant Associations of the
Blue and Ochoco Mountains

Table of Contents

PONDEROSA PINE SERIES

JUNIPER WOODLANDS

SHRUBLANDS

INTRODUCTION

The Blue and Ochoco Mountains Plant Association Classification Field Guide is provided for use by resource managers on land administered by the Forest Service of the Malheur, Ochoco, Umatilla, and Wallowa-Whitman National Forests. This is the second classification of the vegetation of the Blue and Ochoco Mountains. It is a combined revision of the 1973 Plant Community Type classification authored by Dr. Frederick C. Hall as well as a new classification for kinds of vegetation not included in the earlier work (see Appendix A). This classification was developed with a concept similar to that used in the development of the Wallowa-Snake Plant Associations completed in 1987 by Johnson and Simon. The conceptual approach for these investigations is based on providing the field investigator with a floristic indicator species which is diagnostic of a particular environment. That environment in turn has a capability of providing a defined plant community which has been described in the pages that follow.

The descriptions focus on mid to late seral vegetation of the uplands; but also included are descriptions of early seral vegetation commonly found in the Blue and Ochoco Mountains. Earlier seral upland vegetation is being studied as a series of investigations by ecologists working on the four National Forests. Publications relative to earlier seral vegetation will provide emphasis on successional pathways, response to management and successional stage identification. The number of sampled plots in the subalpine of the Blue, Ochoco and Wallowa Mountains requires that more investigation be completed before describing subalpine plant associations; this effort is being conducted on the Malheur, Umatilla, and Wallowa-Whitman. Lastly, the wetland vegetation has not been adequately studied to date. This classification effort has deferred all sampled wetland plots for inclusion with the forthcoming investigation and publication of a riparian classification for the Blue and Wallowa Mountains.

This is not the final classification of the Blue and Ochoco Mountains vegetation. This field guide is designed to provide the professional land manager with enough basic information to adequately identify classified vegetation types and have summary information available for incorporation into findings for good land management decisions. The next classification of the area can be improved by periodic communication with the authors of this guide to enable them to make necessary corrections, incorporate new sampled plot data and re-design the next classification as needed. The authors sincerely hope this 1991 classification will improve our caring for the various natural resources inherent in the ecosystems of the four National Forests.

GEOGRAPHY

The Blue and Ochoco Mountains are part of the Blue Mountains physiographic division which includes the Ochoco Mountains, Strawberry-Aldrich Range, Greenhorn Mountains, Elkhorn Mountains, Wallowa Mountains and the tristate uplands (Baldwin 1964). The Blue Mountains segment is a northeast to southwest trending axis of "old" mountains that begin south of Pomeroy, Washington and end 200 miles to the south near Burns, Oregon. A 50-mile long east-west spur occurs west of Ukiah, Oregon and ends near Fossil, Oregon. The Ochoco Mountains are another east-west trending axis that occur north of Prineville, Oregon and end 60 miles to the east at the South Fork John Day River canyon.

The Blue Mountains physiographic province was divided into three segments for help in portraying the probable distribution of vegetation classified in this guide. The segments are as follows:

North -	The mountainous area North of I-84 (running between La Grande and Pendleton).
Central -	The mountainous area South of I-84 and North of Hwy 26 (running between Unity and Prineville).
South -	The mountainous area South of Hwy 26.

Some of the higher summits of the Blue Mountains are as follows:

Northern Blue Mountains - Oregon Butte (6401 ft.), Mt. Emily (6064 ft.)

Central Blue Mountains - Vinegar Hill (8131 ft.), Elkhorn Peak (8931 ft.)

Southern Blue Mountains - Strawberry Mountains (9038 ft.), Fields Peak (7363 ft.)

Ochoco Mountains - Round Mountain (6753 ft.), Spanish Peak (6885 ft.)

The lowest elevations occur in the northern Blue Mountains where major canyons incise the mountainous topography. The Tucannon River, the Umatilla River, and Mill Creek all exit the national forest at approximately 2300 ft. elevation. Major rivers in the Blue-Ochoco Mountains are the John Day, with its several branches draining much of the western half of the Blue Mountains; the Grande Ronde and Powder Rivers and tributaries draining much of the eastern half of the Blue Mountains; the Umatilla, Walla Walla, Touche, Tucannon, and Wenaha rivers draining much of the northern portion of the Blue Mountains; and the Malheur and its many tributaries draining the southern end of the Blues. The Crooked River drains much of the Ochoco Mountain uplift.

GEOLOGY

Columbia River basalts were formed in the Cenozoic Era (65 million years ago) by extensive vulcanism. In the late Cenozoic the Blue Mountains were uplifted with folding and faulting of the ranges. Prior to the Cenozoic (in the Paleozoic - 250 million years ago) marine sandstones, shale, cherts, and limestone were formed. These oldest rocks of the Blue-Ochocos are found near the head of the Crooked River.

The Mesozoic Era (225-65 million years ago) provided the serpentine of the Strawberry Range; especially noticeable from Indian Creek to Canyon Mountain. In the Cretaceous Period (near the end of the Mesozoic) intrusive rocks were formed with major ore deposition in the Elkhorns, Greenhorns, and Strawberry Ranges. These granodiorites provided the gold and silver which brought the initial miners and started settlements in this area.

The Cenozoic Era provided much of the visible landscape of the Blue and Ochoco Mountains. In the Eocene (35-40 million years ago) the Clarno and John Day formations were deposited by the Blue Mountain volcanoes. The formations consisted of thick rhyolites, breccias, tuffs and basaltic flows. The southwestern portion of the Blue Mountains and most of the Ochoco Mountains are covered by deposits of the Clarno Formation. In the mid Miocene thick layers of lava extruded from fissures in local volcanoes and flooded the landscape. Lava pooled to depths of 50 feet or greater with multiple episodes resulting in layers of basalt more than 2000 feet thick (McKee, 1972). These are known collectively as Columbia River basalts and cover most of the area contained within the Blue Mountains today. A localized center of vulcanism produced the Strawberry Volcanics which covers the Strawberry Mountains to depths of 6500 feet eastward from Indian Creek.

Pleistocene (2-3 million years ago) was an epoch of erosion in this area. Sumpter Valley is an example of deposition made during the Pleistocene of alluvial sand and gravel. Wind deposited loess from the central Washington Basin occurs on portions of the northern Blue Mountains providing highly productive grasslands and shrublands.

Alpine glaciation occurred in the Elkhorns, Greenhorns, and Strawberry Mountains during the Pleistocene. About 12,000 years ago Glacier Peak sent ash eastward which blanketed the Blue Mountains. Then approximately 6,000 years ago, Mt. Mazama erupted sandy volcanic ash to again cover parts of the Blue and Ochoco Mountains (Fryxell, 1965). These ash deposits were then redeposited by wind and water to provide the growing medium for some of our most important and productive plant communities.

SOIL CHARACTERISTICS

Soils of the Blue and Ochoco Mountains are quite variable and may range from those on thin, rocky, low-productivity ridgetop scablands to those in deep ash accumulations on very productive grand fir sites. Soil differences result from variations in climate, topography, parent material, vegetation, and time. The greatest influence to soils in this area has come from ash deposited primarily from Mt. Mazama and Glacier Peak approximately 6,600 and 12,000 years ago respectively (Fryxell, 1965). Perhaps of equal impact, especially in the northern dissected basalt plateau, has been the deposition of loess from the central Washington channeled scablands region prior to and following glaciation during the Pleistocene (1 million years ago); over time much of the material has been eroded away by wind and water (USDA, 1985). Continued weathering of the basalts and other rock types has resulted in a mixing of wind-borne ash and loess with rocky colluvium in many areas. Consequently, soils fall under one of the following broad categories:

1. Residual - derived in place from predominately bedrock or colluvial rock materials.
2. Ash-Loess - derived from deposited and accumulated ash and/or loess over older buried soil material.
3. Mixed - derived from colluvium, ash and/or loess mixed well in surface layers over older buried soil material (Johnson and Simon, 1987).

Of the varied geologic material available for soil formation, basalt and andesite are the most common in the Blue and Ochoco Mountains. Residual soils formed from these materials differ from the volcanic ash and loessial soils in several respects: 1) finer textured in the upper profile, 2) increased structure, 3) higher coarse fragments, 4) lower water-holding capacity, and 5) higher bulk densities. Other materials provide locally important substrates that impart characteristic attributes to soils; as, the occurrence of rhyolitic rock and subsequent low soil nutrient status.

Productivity of forested and non-forested plant communities is closely related to ash and loess content in soils. Unique characteristics of ash soils include: 1) high water holding capacity, 2) high water infiltration rates, 3) low compactability, 4) high detachability, and 5) disproportionately high amounts of nutrients in upper surface layers. Under undisturbed conditions these soils support good vegetation cover which protects the ash from erosion (USDA, 1985).

Loess may also provide important qualities to many soils. Loessial deposits are normally: 1) high in base saturation (can hold a large amount of nutrients), 2) have high content of weathered minerals and are thus high in nutrient reserve, and 3) generally have excellent physical properties (Johnson and Simon, 1987).

Soil characteristics related to parent material interact with other environmental factors to define the distributional limits of plant communities and their individual plant species.

CLIMATE

The relief of the Blue and Ochoco Mountains creates several localized climatic affects. The diversity of landscapes between mountain ranges, rolling topography and deep, dissected canyons influences local climatic patterns. But, the major influence to the regional climate is provided by the Cascade Mountains lying nearly 200 miles to the west. This mountain range forms a barrier against potential modifying effects of warm, moist fronts emanating out of the Pacific Ocean. As a result, the overall climate of the Blue and Ochoco Mountains is labelled Temperate Continental - cool summer phase (Trewartha, 1968). Mean temperature is less than 72 degrees F. in the warmest month and 50 degrees F. for more than three months. Light precipitation, low relative humidity, rapid evaporation, abundant sunshine, and wide temperature and precipitation fluctuations are characteristics of this climate.

A break in the Cascadian barrier is provided by the Columbia River gorge. This topographic feature and the associated Columbia River provide an opportunity for marine climatic conditions to reach the northern Blue Mountains and strongly influence the vegetation. This climate is labeled Temperate Oceanic (Trewartha, 1968) and differs significantly from the Temperate Continental climate in providing greater cloudiness, increased precipitation and higher relative humidities with less fluctuation in winter temperatures. The oceanic influence provides the environment for vegetation more common to the western Cascades to occupy portions of the northern and northwestern Blue Mountains. Examples of this vegetation are grand fir/sword fern-ginger, grand fir/oakfern and grand fir/false bugbane.

The high percentage of cloud days attributed to the Temperate Oceanic climate, versus the high percentage of clear, winter days and nights of Temperate Continental climates, has dramatically influenced the kind of vegetation found in the northern Blue Mountains as contrasted to that found commonly in the southern Blue and Ochoco Mountains. Daubenmire (1956) determined that the oceanic climate promoted the grasslands and rhizomatous shrublands characteristically found in the foothills, slopes and ridgetops of the Blue Mountains adjacent to the Palouse. The continental climate, on the other hand, promotes sagebrush and juniper so commonly found in the Great Basin to the south of the Blue and Ochoco Mountains.

The majority of annual precipitation falls as snow during winter. Late summer and early autumn provide the area with convectional storms resulting from masses of cool air crossing the Cascades and passing over the Blue and Ochoco Mountains at high elevations. The hot, dry surface air violently mixes with this cool, moist upper air mass to provide lightening storms. These events have provided a cyclic, annual abundance of natural fires. The fires historically burned extensively and provided the renovating and rejuvenating force behind the development and composition of Blue Mountain and Ochoco Mountain vegetation. The haze of late summer and the particulates in the air from Blue Mountain fires combined to give a hue to the ridges as seen from afar. Thus early settlers named the Blue Mountains.

THE PLANT ASSOCIATION CONCEPT

The Blue-Ochoco Mountain classification has been developed using the plant association concept for characterizing vegetation based on successional relationships and probable climax species. The following definitions and examples may provide assistance to the field guide user to better understand the categorizations given to the vegetation.

Plant Communities

The plant community is a general term for an assemblage of plants living together and interacting among themselves in a specific location (R6 Ecology Glossary Committee, 1989). It is not a taxonomic unit, has no successional status, and may not be recognized by all investigators. Analagous to "plant communities" are "common names" where no bounds have been set or rules defined by which a particular common name is used. Many plant communities have been sampled which differ in compositional and/or environmental parameters.

The purpose of this classification is to segment the moisture-temperature gradient through recognition of indicative plant species in such a way as to provide easier recognition of similar environments across the landscape. In the analysis of plot data, certain plant communities were undersampled or did not provide adequate representation in the geographic area encompassed by the classification. These "communities" have been given a minimal description and entered in the text and key to recognize the fact that they exist. More information is needed in order to change their status of "community" or incidental vegetation.

Plant Community Types

The plant community type, or p.c.t., is an aggregation of plant communities with similar structure and floristic composition (R6 Ecology Glossary Committee, 1989).

In the Blue-Ochoco Mountains the magnitude of lodgepole pine communities has provided empetus for the description of plant community types based on their regular and repeated occurrence. Other vegetation, AGSP-POSA3-DAUN p.c.t. for example, was sampled enough to demonstrate a pattern but did not meet the standard necessary for plant association status. For this classification, a minimum of four plots was generally used as that sample size where enough information was available to determine plant association status. Ideally, ten plots or more are used to portray a plant association.

Successional Terminology

"Climax" plants are those that are self perpetuating in their environment in the absence of perturbating, degenerating or disturbing influences. Stability with the environment is crucial to the succession of plant communities that ameliorate a site and permit the establishment and maintenance of the "climax community".

In vegetation sampling, ecologists seek those stands which appear to demonstrate stability in order to understand the plant composition and environments which can be characterized in a plant association classification, i.e., a classification of potential natural vegetation.

However, the landscape in the Blue-Ochoco Mountains has undergone, and continues to undergo, modifications that prevent the formation of long-term stable communities. Some natural events (fire, windstorms, browsing animals, flooding) as well as human-induced activities (timber harvest operations, livestock grazing) tend to forestall or disrupt the natural development of vegetation leading to communities with more stable composition and structure.

Succession may be arrested (i.e., maintained by fire at a particular stage), accelerated (i.e., mortality of seral tree species from insects, diseases, windthrow), and retarded (i.e., continued ungulate grazing pressure which degrades the grassland from perennial to annual vegetation dominance).

The identifiable stages of vegetation preceding climax communities are termed "seral stages". In the development of this classification, plots representing various seral stages were used to define "plant community types" as well as the "plant associations". Generally, very early and early seral stages were grouped into plant community types; mid and late seral stages were grouped to define plant associations, since they depict the least change over time and therefore have a more stable composition and structure over time.

Plant Associations

If a stand of vegetation is able to develop and persist in its environment, and if the competitive forces are without major disturbing influences, then following a relatively long period of time those plants capable of reproducing in competition will constitute the "climax community". The unit of classification based on the probable, or projected, climax community type is defined as the "plant association" (R6 Ecology Glossary Committee, 1989). As a combination of similar or compensating environmental factors are repeated across the landscape, a predictable plant community will occupy those sites given time and the lack of disturbance. This will be a climax community comprising the basis for the plant association classification.

Plant associations and plant community types are abstract classification terms. Plant communities, on the other hand, are concrete entities on the landscape, just as a stand of trees, grasses, or shrubland vegetation is recognizable and tangible to the field investigator.

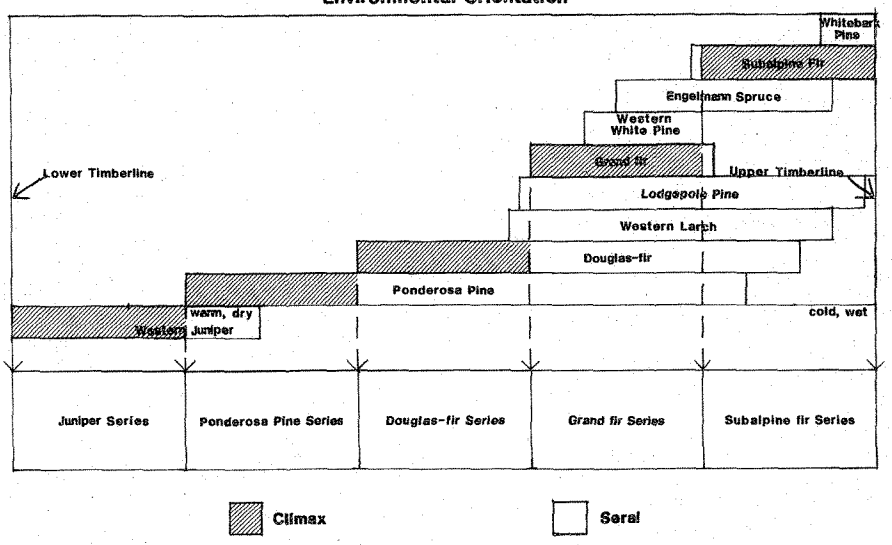
Series

This field guide aggregates the taxonomically related plant associations into series. The name of the series is that of the climax species dominating the principal layer. An example would be the grand fir series in which all ABGR plant associations are arrayed, as well as the seral plant community types and community fragments, related to grand fir climax vegetation.

Zonal Relationships

Individual species occur in a predictable pattern, or juxtaposition, with a unit of area based on the micro environment. Plant associations likewise will tend to occupy predictable positions in a landscape based on habitat features favorable to support the climax community. The principal tree species which constitute the climax dominants predictably occupy environmental zones within a climatic gradient where temperature and moisture vary with change in elevation. Figure 1 (below), depicts the tree species of the Blue and Ochoco Mountains as they would orient from cool, moist to warm, dry environmental conditions on a hypothetical mountain slope. Here whitebark pine culminates the summit at the limits of tree growth and western juniper defines the lower limits of tree growth at the edge of the cold desert steppe. Where the distributional limits of the tree species include climax conditions, the bar graph is "cross hatched."

Fig. 1 - Tree Species of the Blue and Ochoco Mountains Environmental Orientation



INDICATOR SPECIES

The habitat needs of plant species is manifested by certain kinds of environment. Some species require stable conditions, others thrive on reoccurring instability. Some species have adapted to a particular locale due to long-term climatic conditions of the area; others have colonized and thrived due to changes in the microclimate of a particular site. Synecological investigation is rooted in knowledge of the local flora. Constant improvement of this knowledge is essential to understanding plant-environment relationships, and developing and testing hypotheses concerning species occurrence and development.

Having developed hypotheses of plant-environment relationships, the ecologist seeks to identify groupings of plants indicative of similar environments. It is this exercise which leads to the definition of plant community types and plant associations. This process includes review of similar ecological work from adjacent geographic areas in order to ascertain the degree of similarity or dissimilarity which has been afforded to a particular vegetation type. The commonality between investigators is the use of plants to indicate a kind of plant community that is defined by a specific set of environmental parameters. The plants selected to define the plant community type or plant association are those deemed to be the most diagnostic of a particular environment. These are called "indicator plants". While they do not necessarily indicate the sum of all environmental conditions, they are considered the best candidates of the associated flora within a classified type to indicate the occurrence and distribution of that vegetation unit.

Selection of indicative plant species is based on repeated observations; many of which are recorded by plot establishment and data gathering work. Environmental factors are used to determine the ability of a diagnostic plant to represent a type. Examples are -- waterholding capacity, slope position, microrelief, and elevation. Additionally, the relative productivity and growth performance of certain species have often been used to help indicate the type assignment which the indicator plant has suggested. The utility to land management is also given consideration in the selection of certain indicator plants (e.g., Pacific yew in ABGR/CLUN communities where environments and productivities may not be significantly different). Once data are derived and the information is arrayed, the common plant groupings are arranged in repetitive fashion until similar community types are created. The response of plants to disturbance is a factor in the placement of certain plots to a given classification unit based on the degree of ground disturbance, the composition of plant species, and the apparent age or time elapsing from the last significant disturbance.

The indicator species selected are those sought by field investigators to help determine proper assignment to a given plant association or plant community type. A separate field guide to the "Principal Indicator Species of National Forests in Northeastern Oregon and Southeastern Washington" aids the investigator working on the Malheur, Umatilla, and Wallowa-Whitman National Forests. "Major Indicator Shrubs and Herbs on National Forests of Eastern Oregon" will be especially helpful to field investigators working on the Ochoco National Forest.

DATA ANALYSES

Data analyses were accomplished with computer programs developed or adapted by Region 6 ecologists (Volland and Connelly, 1978 and Wheeler, 1987). Following an initial data preparation phase, a series of subjective group orderings were created with consideration given to previous classification efforts in northeastern Oregon and adjacent national forest lands (Hall, 1973; and Johnson and Simon, 1987).

Additionally, ordination and classification programs, DECORANA and TWINSPAN (Hill, 1979), were used to develop concepts of classification group membership, species ecological amplitudes, and temperature and moisture gradients encountered within a series. Displays of these gradients, along with productivity indices, were inspected to adjust previously developed units (plant associations and plant community types). Plot memberships were derived and stand association tables with summary statistics produced.

Subsequently, groups were subjected to a multivariate procedure called stepwise discriminant analysis (BMDO7M Program). During this phase of analyses, site variables and floristic attributes were statistically screened for the most "characteristic" to use in the classification. Then group membership hypotheses were tested and memberships adjusted. These final revisions were incorporated into association tables and statistical summaries which are represented in the individual plant association descriptions and the appendices.

WETLAND VEGETATION

This classification of the Blue and Ochoco Mountain Plant Associations is an upland-oriented treatment of that vegetation principally representative of later seral stages in the forests, grasslands, and shrublands. The field investigator will be unable to classify meadows and riparian communities using the keys of this field guide. The 1973 Blue Mountain classification (Hall 1973) included five classified meadows and riparian communities. These were not addressed in this publication because of sample size and/or lack of data. Until the wetlands are classified in AREA 3, field investigators on the Malheur, Umatilla, and Wallowa-Whitman National Forests may refer to the classification of riparian vegetation conducted by Bud Kovalchik on the Ochoco, Deschutes, Winema, and Fremont National Forests (Kovalchik 1987). The listing of wetland types and assigned ECOCLASS codes from the 1973 classification is as follows:

Dry Meadow (MD)
Moist Meadow (MM)
Wet Meadow (MW)
Quaking Aspen Meadow (HQ-M1)
Ponderosa Pine-Blue Wildrye (CP-M1-11)

EARLY SERAL VEGETATION, DISCLIMAX COMMUNITIES AND ECOTONES

The landscape of the Blue Mountain and Ochoco Mountain national forests is in a constant state of change and modification from the natural. Therefore, plant communities will be encountered which will not readily key using this classification. Some early seral plant community types have been presented. The treatment is far from complete. Successional studies are in progress to interpret the perturbated lands and provide early seral stages of the principal plant associations of the Area. A disturbance key for early seral, very early seral, and disclimactic vegetation would not contain the variation found in the plant communities of the area.

The area of transition between the vegetation of two or more plant associations is termed an ecotone. Up to 40% of the time a field plot tends to occur in an ecotone. The investigator is urged to either move to an adjacent area to determine the plant association or to treat the ecotonal location as a complex by determining the plant associations represented and either labelling one as primary, the other secondary, or giving a percentage split (i.e., 60/40, 50/50, 70/30) for the site.

USE OF THE FIELD GUIDE

Nomenclature:

The plant associations and plant community types have been grouped into "series" based on the projected climax species which dominates the principal layer. For example, in the grand fir series, all included plant communities are those in which grand fir is projected as the climax tree species.

Plant associations are named using the climax dominant species followed by a slash (/) and the listing of the subordinate species of a subordinate life form layer or layers (ABGR/TABR/CLUN). A dash (-) is used to separate names of the same life form (ABGR/VASC-LIBO2).

A species name or code in parentheses denotes the climax dominant of a seral plant community type, i.e., PICO (ABGR)/VAME.

All scientific names follow Hitchcock and Cronquist (Flora of the Pacific Northwest, 1973). Species codes follow Garrison et al (PNW-46, Northwest Plant Names and Symbols for Ecosystem Inventory and Analysis, 1976).

Photos:

The reference pole in most pictures is one meter tall and segmented into decimeters to help visualize size of the vegetation.

Sample Size:

The number of plots used to describe the plant associations and plant community types is provided as follows: (n=8).

Table of Principal Species:

This table contains only the primary species of a plant association or plant community type. Mean coverage is provided for the ocular estimates of canopy cover in percent. Averages were calculated by dividing the total foliar cover of a species when it occurred by the number of plots containing that species. Constancy refers to the percentage of frequency of occurrence by a species in the total number of plots used for describing the plant association or plant community type. The range is the spread of coverage values from the lowest value found to the highest.

Environment Table:

Displayed here are distribution (location) of the vegetation units in the study area, site variables, and soil attributes. The range of values sampled are followed by the mean value in parentheses. The location information (North, Central, South) provides the probable distribution of the various classified types in the Blue and Ochoco Mountains as follows:

North - La Grande RD (North of I-84), Walla Walla RD, Pomeroy RD.
Central - La Grande RD (South of I-84), North Fork John Day RD, Heppner RD, Long Creek RD, and Unity RD (North of Hwy 26).
South - Bear Valley RD, Burns RD, Prairie City RD, Ochoco NF, and Unity RD (South of Hwy 26).

Stand and Overstory Attributes:

Herbage production (above-ground, air dry biomass of forbs, grasses, and sedges), total stand basal area, tree canopy coverage (overstory and understory), and average stand growth basal area are presented. Use stand GBA estimates with caution, as they reflect mixed-species stand conditions. The range (minimum-maximum) is followed by the mean value in parenthesis. Overstory characteristics by species are displayed in the lower table. No. plots = number of plots sampled; Basal area = SQ FT/ACRE; Age= YRS BH; Site index = FT AT 100 YRS; GBA = GROWTH BASAL AREA (SQ FT/ACRE); Productivity Index = SI x GBA x .004. Value to the left of the slash (/) is the mean, to the right is the 95% confidence interval (mean/CI - 95%).

Utilization Response: A listing of key plants within the type and their response to grazing or browsing pressure.

D = decreaser
IP = palatable increaser
IU = unpalatable increaser
INV = invader

Vegetative Composition: A brief description of the principal species comprising the type.

Typal Comparison: A brief comparison between types; *especially those similar in composition.*

Successional Relationships: A description of those species which precede the climax dominants, reaction to disturbances, and the relationship of fire and grazing as key events in succession.

Management Considerations: A brief review of response of the vegetation to key modifications by silvicultural treatment, range and wildlife use, and role of fire.

Relationship to Other Studies: A listing of authors and studies with similar described vegetation.

CONSIDERATIONS FOR ESTIMATING COVER

Surface area of per cent canopy coverage is displayed in the following table. It is intended to guide the field investigator in ocularly estimating abundances of indicator plant species for use in the following vegetation keys.

	PLOT SIZE*			
% Canopy Coverage	375m²		1/10 acre	
	x**	r***	x**	r***
1	1.94m (6.36 ft.)	1.09m (3.58 ft.)	6.6 ft. (2.01m)	3.72 ft. (1.13m)
5	4.33m (14.20 ft.)	2.44m (8 ft.)	14.76 ft. (4.5m)	8.33 ft. (2.54m)
10	6.12m (20.07 ft.)	3.45m (11.32 ft.)	20.87 ft. (6.37m)	11.78 ft. (3.59m)

* Radius of 375m² = 10.93m (35.85 ft.)
Radius of 1/10 acre = 11.32m (37.24 ft.)

** x is the dimension of one side of a square equal to the % coverage.

*** r is the radius of a circular area equal to the % coverage.

Keys to Blue-Ochoco Mountain Vegetation

The Keys which follow assist in the determination of which series, plant association, plant community type, or commur best fits a particular site.

Cover Percentages

The keys use percentage cover breaks which require the user to determine the canopy covers of a particular species in the field. The tie-breaking rule is that the "call" be made to the l indicator species which is the more sensitive to the environment. Should the investigator de mine that the limited amount of a particular indicator species represents a microsite, rather th the stand being sampled, the call should go to the less restrictive classified type instead of to vegetation represented on the microsite.

Three percentages are used as "breaks" in the keys. Trees and shrubs, which tend to be individu ly clumped (i.e., - bitterbrush), are separated using 10% as a break. Rhizomatous and stoloni ous shrubs, grasses, sedges and larger forbs are generally separated using a 5% break. T smaller indicative plants (i.e., queenscup beadlily, twinflower, false bugbane) require a m restrictive cover break of 1% due to their greater sensitivity to the environment. The sma indicator plants having a narrow ecologic amplitude provide enough representation in 1% of plot area to reflect their contribution to the community. The larger indicator plants with a wi ecologic amplitude would be incidentally in the plot at a lower coverage break. Therefore, 5% a 10% are used with the larger statured vegetation.

There are limitations to the use of the Keys and certain rules must be followed.

Limitations

1. The Keys are based on 800 sampled plots located across the extent of the axes of the B and Ochoco Mountains (excluding the Wallowa Mountains). This large geographic a contains a high variation in plant communities and environments. Not all the environm tal variation was sampled; therefore, the classification may not describe the vegetal occurring on some sites.

2. The natural stands have been, and continue to be, highly modified. Sites exhibit severe disturbances from logging, grazing, fire, agriculture pursuits, and construct activities may not be readily determined from these Keys.

3. Depauperate forest understories may not contain indicator plant species in suffic abundance to properly assign using this Key. Depauperate stands are usually mature v sparse ground vegetation. The lack of ground vegetation may result from heavy l accumulation, dense tree stocking or as a result of the environment.

Rules for Use

1. Select sites supporting vegetation demonstrating maturity and stability. In situati where site disturbance has been severe resulting in vegetation representing early s stages, an adjacent area determined to represent a similar site should be selected examination and determination of plant association.

2. Determine the proper series Key by following the dichotomous "Key to Blue-Och Mountains Vegetation." Then go to the indicated "Series" Key and follow it "step by s until the kind of vegetation is encountered. Then turn to the page number provided review the type description to verify the accuracy of the identification.

3. In stands where the undergrowth vegetation is depauperate due to dense tree overstc or thick duff accumulation inhibiting plant growth, adjustment of the coverage perc ages downward may be necessary to properly key to the correct plant association or p community type. The other alternative is to move to an adjacent stand where light surface conditions have permitted a better expression of the understory vegetation.

KEY TO BLUE-OCHOCO MOUNTAINS VEGETATION

1a. Trees present with coverage equal to or exceeding 10% — 2

1b. Trees absent or present with coverages less than 10% — 11

2a. Whitebark pine (PIAL) present and reproducing with total coverage equal to or exceeding 10% — See subalpine fir series key — pg. 12

2b. Whitebark pine absent or present with coverage less than 10% — 3

3a. Subalpine fir (ABLA2) present and reproducing with total coverage equal to or exceeding 10% — See subalpine fir series key — pg. 12

3b. Subalpine fir absent or present with coverage less than 10% — 4

4a. Grand fir (ABGR) present and reproducing with total coverage equal to or exceeding 10% — See grand fir series key — pg. 14

4b. Grand fir absent or present with coverage less than 10% — 5

5a. Lodgepole pine (PICO) present with coverage equal to or exceeding 5% — 6

6a. Lodgepole pine reproducing in the absence of true fir (ABLA2, ABGR) species — See lodgepole pine series key — pg. 16

6b. Lodgepole pine present with reproducing true fir species — 7

7a. Subalpine fir present and reproducing — See subalpine fir series key — pg. 12

7b. Grand fir present and reproducing — See grand fir series key — pg. 14

5b. Lodgepole pine absent or present with coverage less than 5% — 8

8a. Douglas-fir (PSME) present and reproducing with total coverage equal to or exceeding 10% — See Douglas-fir series key — pg. 17

8b. Douglas-fir absent or present with coverage less than 10% — 9

9a. Ponderosa pine (PIPO) present and reproducing with total coverage equal to or exceeding 10% — See ponderosa pine series key — pg. 18

9b. Ponderosa pine absent or present with coverage less than 10% — 10

10a. Western juniper (JUOC) present and reproducing with total coverage equal to or exceeding 10% — See western juniper series key — pg. 20

10b. Western juniper absent or present with coverage less than 10% — 11

11a. Shrubs present with coverage equal to or exceeding 5% — See shrubland series key — pg. 21

11b. Shrubs absent or present with coverage less than 5% — See grassland series key — pg. 23

KEY TO SUBALPINE FIR (ABLA2) SERIES VEGETATION

(Subalpine fir must be present and reproducing successfully; total coverage must equal or exceed 10%; lodgepole pine co-dominated or dominated stands may be assigned to plant associations in this series where subalpine fir is present and reproducing. Whitebark pine stands are assigned to plant communities in this series.)

1a. Fool's huckleberry (MEFE) present with coverage equal to or exceeding 10% — ABLA2/MEFE — pg. 31

1b. Fool's huckleberry absent or with coverage less than 10% — 2

2a. White rhododendron (RHAL) present with coverage equal to or exceeding 5% — ABLA2/RHAL communities — pg. 42

2b. White rhododendron absent or with coverage less than 5% — 3

3a. False bugbane (TRCA3) present and well distributed throughout the stand with coverage equal to or exceeding 1% — ABLA2/TRCA3 — pg. 25

3b. False bugbane absent or with coverage less than 1% — 4

4a. Queen's cup beadlily (CLUN) present and well distributed throughout the stand with coverage equal to or exceeding 1% — ABLA2/CLUN — pg. 27

4b. Queen's cup beadlily absent or with coverage less than 1% — 5

5a. Twinflower (LIBO2) present and well distributed throughout the stand with coverage equal to or exceeding 1% — ABLA2/LIBO2 — pg. 29

5b. Twinflower absent or with coverage less than 1% — 6

6a. Big huckleberry (VAME) present with coverage equal to or exceeding 5% — 7

7a. Lodgepole pine (PICO) dominant or co-dominant with subalpine fir — 8

8a. Pinegrass (CARU) coverage equal to or exceeding 1% — PICO(ABLA2)/VAME/CARU pct — pg. 42

8b. Pinegrass absent or coverage less than 1% — PICO(ABLA2)/VAME pct — pg. 42

7b. Lodgepole pine absent or subordinate; subalpine fir dominant — ABLA2/VAME — pg. 33

6b. Big huckleberry absent or with coverage less than 5% — 9

9a. Heartleaf arnica (ARCO) present with coverage equal to or exceeding 10% — ABLA2/ARCO pct — pg. 39

9b. Heartleaf arnica absent or with coverage less than 10% — 10

10a. Alpine fleeceflower (POPH) present with coverage equal to or exceeding 5% — ABLA2-PIAL/POPH communities — pg. 42

10b. Alpine fleeceflower absent or with coverage less than 5% — 11

11a. Drummond's rush (JUDR) present with coverage equal to or exceeding 5% — ABLA2-PIAL/JUDR communities — pg. 43

11b. Drummond's rush absent or with coverage less than 5% — 12

12a. Grouse huckleberry (VASC) present with coverage equal to or exceeding 5% — 13

13a. Lodgepole pine dominant or co-dominant with subalpine fir — PICO(ABLA2)/VASC pct — pg. 41

13b. Lodgepole pine absent or subordinate; subalpine fir dominant — ABLA2/VASC — pg. 35

12b. Grouse huckleberry absent or with coverage less than 5% — 14

14a. Elk sedge (CAGE) present with coverage equal to or exceeding 5% — 15

15a. Lodgepole pine (PICO) dominant or co-dominant with subalpine fir — PICO(ABLA2)/CAGE communities — pg. 43

15b. Lodgepole pine absent or subordinate; subalpine fir dominant — ABLA2/CAGE — pg. 37

14b. Elk sedge absent or with coverage less than 5% — 16

16a. Skunk-leaved polemonium (POPU) present with coverage equal to or exceeding 5% — ABLA2-PIAL/POPU communities — pg. 43

16b. Skunk-leaved polemonium (POPU) absent or with coverage less than 5%; western needlegrass (STOC) present with coverage equal to or exceeding 5% — 17

17a. Lodgepole pine dominant or co-dominant with subalpine fir — PICO(ABLA2)/STOC communities — pg. 43

17b. Lodgepole pine absent or subordinate; subalpine fir dominant — ABLA2/STOC pct — pg. 40

KEY TO GRAND FIR (ABGR) SERIES VEGETATION

(Grand fir must be present and successfully reproducing; total coverage must equal or exceed 10%; lodgepole pin co-dominated or dominated stands may be assigned to plant associations in the series where grand fir is present an reproducing.)

1a. Oakfern (GYDR) present with coverage equal to or exceeding 5%
ABGR/GYDR pg. 45

1b. Oakfern absent or with coverage less than 5% 2

2a. Ginger (ASCA3) or sword fern (POMU) present and well distributed throughout the stand with coverage equal to or exceeding 1%
ABGR/POMU-ASCA3 pg. 47

2b. Ginger or sword fern absent or with coverage less than 1% 3

3a. False bugbane (TRCA3) present and well distributed throughout the stand with coverage equal to or exceeding 1% ABGR/TRCA3 pg. 49

3b. False bugbane absent or with coverage less than 1% 4

4a. Sitka alder (ALSI) present and dominant as a tall shrub beneath a lodgepole pine overstory
PICO(ABGR)/ALSI communities pg. 78

4b. Sitka alder absent or subordinate in the shrub layer 5

5a. Pacific yew (TABR) present and well distributed throughout the stand with coverage equal to or exceeding 1% 6

6a. Queen's cup beadlily (CLUN) present with coverage equal to or exceeding 5%
ABGR/TABR/CLUN pg. 5

6b. Queen's cup beadlily absent or with coverage less than 5%
ABGR/TABR/LIBO2 pg. 5

5b. Pacific yew absent or with coverage less than 1% 7

7a. Rocky Mtn. maple (ACGL) present with coverage equal to or exceeding 5%
ABGR/ACGL pg. 5

7b. Rocky Mtn. maple absent or with coverage less than 5% 8

8a. Queen's cup beadlily (CLUN) present and well distributed throughout the stand with coverage equal to or exceeding 1%
ABGR/CLUN pg. 5

8b. Queen's cup beadlily absent or with coverage less than 1% 9

9a. Twinflower (LIBO2) present and well distributed throughout the stand with coverage equal to or exceeding 1% — 10

10a. Big huckleberry (VAME) present with coverage equal to or exceeding 5% — 11

11a. Lodgepole pine (PICO) co-dominant or dominant with grand fir — PICO(ABGR)/VAME-LIBO2 pct — pg. 76

11b. Lodgepole pine absent or subordinate; grand fir dominant — ABGR/LIBO2 — pg. 59

10b. Big huckleberry absent or with coverage less than 5% — 12

12a. Grouse huckleberry (VASC) present with coverage equal to or exceeding 5% — ABGR/VASC-LIBO2 — pg. 63

12b. Grouse huckleberry absent or with coverage less than 5% — 13

13a. Pinemat manzanita (ARNE) dominant as an understory shrub with lodgepole pine overstory — PICO(ABGR)/ARNE communities — pg. 77

13b. Pinemat manzanita absent or subordinate in the shrub layer — ABGR/LIBO2 — pg. 59

9b. Twinflower absent or with coverage less than 1% — 14

14a. Big huckleberry (VAME) present with coverage equalling or exceeding 5% — 15

15a. Lodgepole pine (PICO) co-dominant or dominant with grand fir — 16

16a. Pinegrass (CARU) present with coverage equal to or exceeding 1% — PICO(ABGR)/VAME/CARU pct — pg. 76

16b. Pinegrass absent or with coverage less than 1% — 17

17a. Bracken (PTAQ) present with coverage equal to or exceeding 1% — PICO(ABGR)/VAME/PTAQ communities — pg. 77

17b. Bracken absent or with coverage less than 1% — PICO(ABGR)VAME pct — pg. 76

15b. Lodgepole pine absent or subordinate; grand fir dominant — 18

18a. Alaska yellow-cedar (CHNO) present with coverage equal to or exceeding 10% — ABGR-CHNO/VAME communities — pg. 78

18b. Alaska yellow-cedar absent or with coverage less than 10% — ABGR/VAME — pg. 61

14b. Big huckleberry absent or with coverage less than 5% — 19

19a. Grouse huckleberry (VASC) present with coverage equal to or exceeding 5% — 20

20a. Lodgepole pine co-dominant or dominant with grand fir — PICO(ABGR)/VASC/CARU pct — pg. 77

20b. Lodgepole pine absent or subordinate; grand fir dominant — ABGR/VASC — pg. 65

19b. Grouse huckleberry absent or with coverage less than 5% — 21

21a. Columbia brome (BRVU) present with coverage equal to or exceeding 5% — ABGR/BRVU — pg. 67

21b. Columbia brome absent or with coverage less than 5% — 22

22a. Birchleaf spiraea (SPBE) present with coverage equal to or exceeding 5% — ABGR/SPBE — pg. 69

22b. Birchleaf spiraea absent or with coverage less than 5% — 23

23a. Pinegrass (CARU) present with coverage equal to or exceeding 5% — 24

24a. Lodgepole pine (PICO) dominant or co-dominant with grand fir — PICO(ABGR)/CARU pct — pg. 77

24b. Lodgepole pine absent or subordinate; grand fir dominant — ABGR/CARU — pg. 71

23b. Pinegrass absent or with coverage less than 5% — 25

25a. Heartleaf arnica (ARCO) present with coverage equal to or exceeding 10% — ABGR/ARCO pct — pg. 75

25b. Heartleaf arnica absent or with coverage less than 10%; elk sedge (CAGE) coverage equal to or exceeding 5% — ABGR/CAGE — pg. 73

KEY TO LODGEPOLE PINE (PICO) SERIES VEGETATION

Lodgepole pine dominates with an absence of true fir in the stand. Grand fir and subalpine fir are not projected as climax dominants in communities assigned to plant associations within this series. Lodgepole pine is projected as the climax species based on cold air ponding and topographic factors.

1. Pinegrass (CARU) present with coverage equal to or exceeding 5%; grouse huckleberry often associated — PICO/CARU — pg. 79

KEY TO DOUGLAS-FIR (PSME) SERIES VEGETATION

(Douglas-fir must be present and successfully reproducing; total coverage must equal or exceed 10%)

1a.	Big huckleberry (VAME) present with coverage equal to or exceeding 5%	PSME/VAME	pg. 81
1b.	Big huckleberry absent or with coverage less than 5%		2
	2a. Ninebark (PHMA) present with coverage equal to or exceeding 10%	PSME/PHMA	pg. 83
	2b. Ninebark absent or with coverage less than 10%		3
3a.	Oceanspray (HODI) present with coverage equal to or exceeding 10%	PSME/HODI	pg. 85
3b.	Oceanspray absent or with coverage less than 10%		4
	4a. Mountain mahogany (CELE) present with coverage equal to or exceeding 10%	PSME/CELE/CAGE pct	pg. 95
	4b. Mountain mahogany absent or with coverage less than 10%		5
5a.	Common snowberry (SYAL) present with coverage equal to or exceeding 5%	PSME/SYAL	pg. 87
5b.	Common snowberry absent or with coverage less than 5%		6
	6a. Mountain snowberry (SYOR) present with coverage equal to or exceeding 10%	PSME/SYOR	pg. 89
	6b. Mountain snowberry absent or with coverage less than 10%		6
7a.	Pinegrass (CARU) present or with coverage equal to or exceeding 5%	PSME/CARU	pg. 91
7b.	Pinegrass absent or with coverage less than 5%; elk sedge (CAGE) coverage equal to or exceeding 5%	PSME/CAGE	pg. 93

KEY TO PONDEROSA PINE (PIPO) SERIES VEGETATION

(Ponderosa pine must be present and successfully reproducing; total coverage must equal or exceed 10%)

1a. Squaw apple (PERA3) present with coverage equal to or exceeding 10% PIPO/PERA3 communities pg. 12

1b. Squaw apple absent or with coverage less than 10% 2

2a. Mountain mahogany (CELE) present with coverage equal to or exceeding 10% 3

3a. Elk sedge (CAGE) present with coverage equal to or exceeding 5% PIPO/CELE/CAGE pg. 97

3b. Elk sedge absent or with coverage less than 5% 4

4a. Wheeler's bluegrass (PONE) present with coverage equal to or exceeding 5% PIPO/CELE/PONE pg. 9

4b. Wheeler's bluegrass absent or with coverage less than 5% PIPO/CELE/FEID-AGSP pg. 1

2b. Mountain mahogany absent or with coverage less than 10% 5

5a. Common snowberry (SYAL) present with coverage equal to or exceeding 5% PIPO/SYAL pg. 1

5b. Common snowberry absent or with coverage less than 5% 6

6a. Mountain snowberry (SYOR) present with coverage equal to or exceeding 10% PIPO/SYOR pg. 1

6b. Mountain snowberry absent or with coverage less than 10% 7

7a. Pinegrass (CARU) present with coverage equal to or exceeding 5% PIPO/CARU pg. 1

7b. Pinegrass absent or with coverage less than 5% 8

8a. Bitterbrush (PUTR) present with coverage equal to or exceeding 5% — 9

9a. Ross' sedge (CARO) present with coverage equal to or exceeding 5% — PIPO/PUTR/CARO — pg. 111

9b. Ross' sedge absent or with coverage less than 5% — 10

10a. Elk sedge (CAGE)present with coverage equal to or exceeding 10% — PIPO/PUTR/CAGE — pg. 113

10b. Elk sedge absent or with coverage less than 10% — PIPO/PUTR/FEID-AGSP — pg. 115

8b. Bitterbrush absent or with coverage less than 5% — 11

11a. Mountain big sagebrush (ARTRV) present with coverage equal to or exceeding 10% — 12

12a. Elk sedge (CAGE) present with coverage equal to or exceeding 5% — PIPO/ARTRV/CAGE communities — pg. 123

12b. Elk sedge absent or with coverage less than 5% — PIPO/ARTRV/FEID-AGSP — pg. 117

11b. Mountain big sagebrush absent or with coverage less than 10% — 13

13a. Elk sedge (CAGE) present with coverage equal to or exceeding 10% — PIPO/CAGE — pg. 109

13b. Elk sedge absent or with coverage less than 10% — 14

14a. Smooth sumac (RHGL) present with coverage equal to or exceeding 10% — PIPO/RHGL communities — pg. 124

14b. Smooth sumac absent or with coverage less than 10% — 15

15a. Low sagebrush (ARAR) present with coverage equal to or exceeding 5% — PIPO/ARAR communities — pg. 123

15b. Low sagebrush absent or with coverage less than 5% — 16

16a. Idaho fescue (FEID) present with coverage equal to or exceeding 10% — PIPO/FEID — pg. 119

16b. Idaho fescue absent or with coverage less than 10% — PIPO/AGSP — pg. 121

KEY TO WESTERN JUNIPER (JUOC) SERIES VEGETATION

(Western juniper must be present with coverage equal to or exceeding 10%)

1a. Mountain mahogany (CELE) present with coverage equal to or exceeding 10% ... 2

2a. Elk sedge (CAGE) present with coverage equal to or exceeding 10% ... JUOC/CELE/CAGE communities ... pg. 12

2b. Elk sedge absent or with coverage less than 10% ... JUOC/CELE/FEID-AGSP communities ... pg. 12

1b. Mountain mahogany absent or with coverage less than 10% ... 3

3a. Bitterbrush (PUTR) present with coverage equal to or exceeding 10% ... JUOC/PUTR/FEID-AGSP ... pg. 12

3b. Bitterbrush absent or with coverage less than 10% ... 4

4a. Mountain big sagebrush present with coverage equal to or exceeding 10% ... JUOC/ARTRV/FEID-AGSP communities ... pg. 12

4b. Mountain big sagebrush absent or with coverage less than 10% ... 5

5a. Low sagebrush (ARAR) present with coverage equal to or exceeding 5% ... JUOC/ARAR communities ... pg. 13

5b. Low sagebrush absent or with coverage less than 5% ... 5

6a. Stiff sagebrush (ARRI) present with coverage equal to or exceeding 5% ... JUOC/ARRI communities ... pg. 13

6b. Stiff sagebrush absent or with coverage less than 5% ... JUOC/FEID-AGSP ... pg. 12

KEY TO SHRUBLAND VEGETATION

Shrub coverage by diagnostic species must equal or exceed 5%)

1a. Sitka alder (ALSI) present with coverage equal to or exceeding 10%
ALSI communities — pg. 148

1b. Sitka alder absent or with coverage less than 10% — 2

2a. Ninebark (PHMA) present with coverage equal to or exceeding 10%
PHMA-SYAL — pg. 131

2b. Ninebark absent or with coverage less than 10% — 3

3a. Snowbrush ceanothus (CEVE) present with coverage equal to or exceeding 10%
CEVE communities — pg. 148

3b. Snowbrush ceanothus absent or with coverage less than 10% — 4

4a. Mountain mahogany (CELE) present with coverage equal to or exceeding 10% — 5

5a. Elk sedge (CAGE) present with coverage equal to or exceeding 10%
CELE/CAGE communities — pg. 149

5b. Elk sedge absent or with coverage less than 10%
CELE/FEID-AGSP — pg. 133

4b. Mountain mahogany absent or with coverage less than 10% — 6

6a. Common snowberry (SYAL) present with coverage equal to or exceeding 10%
SYAL communities — pg. 148

6b. Common snowberry absent or with coverage less than 10% — 7

7a. Mountain snowberry (SYOR) present with coverage equal to or exceeding 10%
SYOR communities — pg. 149

7b. Mountain snowberry absent or with coverage less than 10% — 8

8a. Bitterbrush (PUTR) present with coverage equal to or exceeding 10%
PUTR/FEID-AGSP — pg. 135

8b. Bitterbrush absent or with coverage less than 10% — 9

9a. Mountain big sagebrush (ARTRV) present with coverage equal to or exceeding 5% — 10

10a. Elk sedge (CAGE) present with coverage equal to or exceeding 10%
ARTRV/CAGE — pg. 137

10b. Elk sedge absent or with coverage less than 10% — 11

11a. Idaho fescue and/or bluebunch wheatgrass present with coverage equal to or exceeding 10%
ARTRV/FEID-AGSP — pg. 139

11b. Idaho fescue and/or bluebunch wheatgrass absent or with coverage less than 10% — 12

12a. Mountain brome (BRCA) present with coverage equal to or exceeding 5% — ARTRV/BRCA pct. — pg. 14

12b. Mountain brome absent or with coverage less than 5%; western needlegrass (STOC) present with coverage equal to or exceeding 5% — ARTRV/STOC communities — pg. 14

9b. Mountain big sagebrush absent or with coverage less than 5% — 13

13a. Low sagebrush (ARAR) present with coverage equal to or exceeding 10% — 14

14a. Idaho fescue (FEID) or bluebunch wheatgrass (AGSP) present with coverage equal to or exceeding 5% — ARAR/FEID-AGSP — pg. 14

14b. Idaho fescue or bluebunch wheatgrass absent or with coverage less than 5% — ARAR/POSA3 — pg. 14

13b. Low sagebrush absent or with coverage less than 10%; stiff sagebrush (ARRI) present — ARRI/POSA3 — pg. 14

KEY TO GRASSLAND VEGETATION

(Trees and shrubs are absent, or their coverage is less than 5%)

1a. Green fescue (FEVI) present with coverage equal to or exceeding 10%
FEVI (subalpine communities) pg. 158

1b. Green fescue absent or with coverage less than 10% 2

2a. Elk sedge present with coverage greater than 10%
CAGE (Subalpine communities) pg. 147

2b. Elk sedge absent or with coverage less than 10% 3

3a. Hood's sedge (CAHO) present with coverage equal to or exceeding 10%
CAHO (subalpine communities) pg. 158

3b. Hood's sedge absent or with coverage less than 10% 4

4a. Idaho fescue (FEID) present with coverage equal to or exceeding 10% 5

5a. Elevations above 6000 feet
FEID (subalpine communities) pg. 158

5b. Elevation below 6000 feet
FEID-AGSP pg. 151

4b. Idaho fescue absent or with coverage less than 10% 6

6a. Bluebunch wheatgrass (AGSP) present with coverage equal to or exceeding 10% 7

7a. Onespike oatgrass (DAUN) present and well distributed throughout the stand with coverage equal to or exceeding 1% and soil depth 10 inches or less AGSP-POSA3-DAUN pct pg. 157

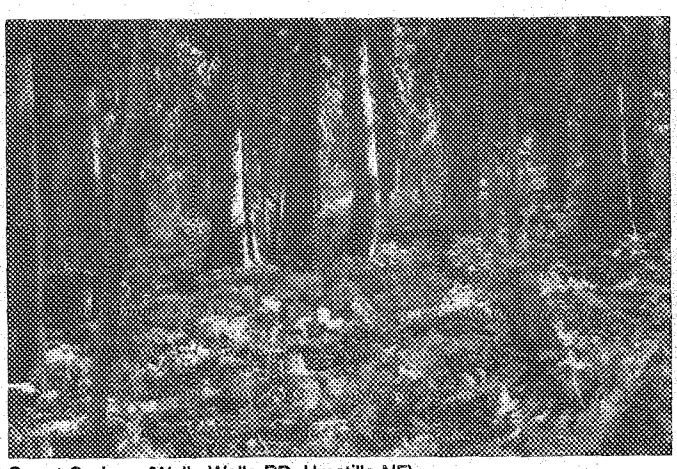
7b. Onespike oatgrass absent or with coverage less than 1% and soil depth greater than 10 inches AGSP-POSA3 pg. 153

6b. Bluebunch wheatgrass absent or with coverage less than 10% 8

8a. Sandberg's bluegrass (POSA3) present with coverage equal to or exceeding 5%
POSA3-DAUN pg. 155

8b. Sandberg's bluegrass absent or with coverage less than 5%
STOC (subalpine communities) pg. 159

Subalpine fir/false bugbane plant association
Abies lasiocarpa/Trautvetteria caroliniensis
ABLA2/TRCA3 (CEF3 31)



Spout Springs (Walla Walla RD, Umatilla NF)

Table of Principal Species (n = 5)

Species	Code	Mean Cov (%)	Cons. (%)	Range
subalpine fir	ABLA2	20	100	4-40
Engelmann spruce	PIEN	30	100	7-42
lodgepole pine	PICO	18	40	15-20
grand fir	ABGR	3	40	1-5
big huckleberry	VAME	5	40	2-7
grouse huckleberry	VASC	11	40	1-20
Sitka alder	ALSI	4	40	3-4
swamp gooseberry	RILA	14	40	2-25
prince's pine	CHUM	2	40	1-2
bearberry honeysuckle	LOIN	2	60	1-5
Columbia brome	BRVU	4	80	1-8
false bugbane	TRCA3	13	100	2-30
heartleaf arnica	ARCO	4	60	1-7
roundleaved violet	VIOR2	8	80	2-20
sidebells pyrola	PYSE	4	80	2-7
Piper's anemone	ANPI	5	60	3-7
skunkleaved polemonium	POPUC	2	60	1-4
meadowrue	THOC	8	80	3-15
sweet cicely	OSCH	2	60	1-2
sitka valerian	VASI	2	60	1-3
starry Solomon's seal	SMST	2	60	1-3
bigleaf sandwort	ARMA3	4	60	1-7
bedstraw	GATR	2	60	1-4
foamflower	TITRU	4	40	3-4
monkshood	ACCO	4	40	3-4

ENVIRONMENT
Location: North, central
Elevation: 4870 - 5700 ft. (5166 ft.)
Aspect: All aspects
Slope: 1-40% (11%)
Terrain features: Middle or lower 1/3 of slope, toeslope, or bottom positions on flat or concave surfaces in steep, rolling to undulating or flat terrain.
Soil Depth: 28-76 in. (50 in.)
Ash Depth: 23-32 in. (27 in.)
Surface soil textures: silt loam, silt
Subsurface soil textures: silt loam, silt
Coarse fragments: 2-27% (16%)
Parent material: Residuum, colluvium, and alluvium of igneous rocks with a mantle of volcanic ash.

UTILIZATION RESPONSE
D - TRCA3 (Sheep)
IP - OSCH, ACCO
IU - ARCO, POPUC, THOC
INV - -

STAND AND OVERSTORY ATTRIBUTES (n=5)
HERBAGE PRODUCTION (LBS/ACRE AIR DRY): 200-600 (382)
TOTAL BASAL AREA (SQ FT/ACRE): 143-310 (199)
TREE CANOPY COVERAGE (%): 47-77 (59)
STAND GBA (SQ FT/ACRE): 147-350 (222)

SPECIES	NO. PLOTS	BASAL AREA	AGE	SITE INDEX	GBA	PROD. INDEX
ABLA2	6	90/31	87/18	96/28	207/112	90/75
PIEN	8	62/41	114/34	101/22	193/43	81/23
PICO	2	95/1080	78/32	85/191	230/769	82/438

Veg. Composition: Cool, moist sites where spruce is strongly associated with subalpine fir. Forbs indicating the cool, moist environment are false bugbane, foamflower, and Sitka valerian.

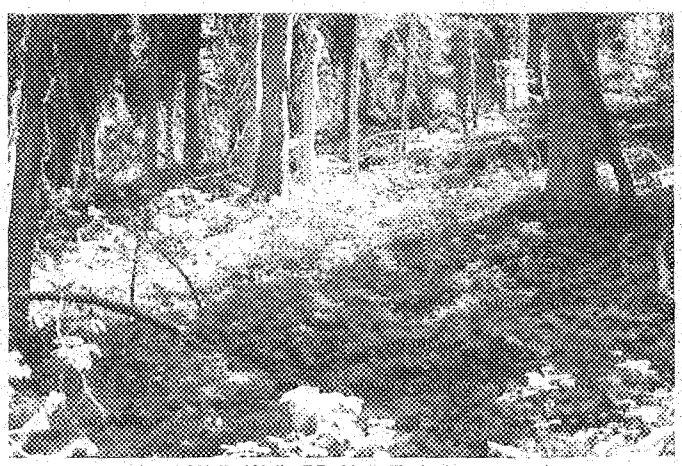
Typal Comparisons: This association, the most mesic of the ABLA2 series, is found in topographically moist areas or seeps. Ash depth and soil water holding capacity are environmental factors supporting mesic-site plants as an expression of the unit. Some of the highest basal areas and tree productivities of the series are supported by these sites.

Successional Relationships: Lodgepole pine and western larch are seral to subalpine fir on gentle slopes. Shrub cover is relatively low in late seral stands. Grouse huckleberry and big huckleberry are more prevalent in earlier seral stands. Swamp gooseberry, heartleaf arnica, and woods strawberry tend to increase with disturbance.

Management Considerations: Where this type occurs near perennial or ephemeral streams, timber management options are limited. When encountered on the uplands, subsurface drainage may dictate limitations in road building activities and silvicultural options. Wildlife and cattle use sites intensively as thermal cover.

Relationship to Other Studies: Similar to ABLA2/CACA and ABLA2/STAM of Cooper, Neiman, Steele (1987) in northern Idaho; Steele's (1981) Ligusticum canbyi phases of ABLA2/CACA and ABLA2/STAM are similar in central Idaho. Plots pertaining to this plant association were deferred in the Wallowa Mountains for separate subalpine classification. Incorporated in ABLA2/VAME or ABLA2/VASC in Blue Mountains (Hall, 1973).

Subalpine fir/queen's cup beadlily plant association
Abies lasiocarpa/Clintonia uniflora
ABLA2/CLUN (CES3 14)



Yellowjacket Ridge (Walla Walla RD, Umatilla NF)

Table of Principal Species (n = 5)

Species	Code	Mean Cov (%)	Cons. (%)	Range
subalpine fir	ABLA2	29	100	7-50
Engelmann spruce	PIEN	23	100	5-41
western larch	LAOC	4	80	1-10
lodgepole pine	PICO	19	40	13-25
big huckleberry	VAME	31	100	1-55
grouse huckleberry	VASC	2	40	1-3
prince's pine	CHUM	2	80	1-4
mountain-ash	SOSI	2	60	1-5
Utah honeysuckle	LOUT2	3	40	1-5
Columbia brome	BRVU	2	60	1-5
queen's cup beadlily	CLUN	14	100	3-30
heartleaf arnica	ARCO	25	100	3-60
round leaved violet	VIOR2	4	80	1-8
Piper's anemone	ANPI	2	80	1-3
white hawkweed	HIAL	1	80	1-2
sidebells pyrola	PYSE	1	60	1-1
skunkleaved polemonium	POPUC	14	60	1-40
meadowrue	THOC	2	60	1-3
false hellebore	VECA	1	60	1-1
Sitka valerian	VASI	8	40	1-15

ENVIRONMENT
Location: North
Elevation: 4575 - 5650 ft. (5107 ft.)
Aspect: All aspects
Slope: 5-45% (19%)
Terrain features: Upper, middle, or lower 1/3 of slope, toeslope, or bottom positions on all surfaces in steep, rough to rolling or undulating terrain.
Parent material: Colluvium and alluvium of igneous rocks with a mantle of volcanic ash.

UTILIZATION RESPONSE
D - BRVU
IP - HIAL, VASI
IU - CLUN, POPUC, THOC, VAME
INV - THMO, RILA

STAND AND OVERSTORY ATTRIBUTES (n=4)
HERBAGE PRODUCTION (LBS/ACRE AIR DRY): 300-375 (338)
TOTAL BASAL AREA (SQ FT/ACRE): 143-240 (194)
TREE CANOPY COVERAGE (%): 63-66 (65)
STAND GBA (SQ FT/ACRE): 191-377 (260)

SPECIES	NO. PLOTS	BASAL AREA	AGE	SITE INDEX	GBA	PROD. INDEX
ABLA2	4	79/122	83/39	84/17	308/156	117/81
PIEN	3	81/114	73/68	87/8	329/296	127/111
LAOC	2	32/153	137/1048	104/248	224/781	107/597

Veg. Composition: Cool, moist sites are defined by subalpine fir and spruce containing queen's cup beadlily beneath big huckleberry. Important associated forbs to queen's cup beadlily are: Columbia brome, round leaved violet, sidebells pyrola, skunkleaved polemonium and sitka valerian. This plant association is reflective of the maritime climate that prevails in the northern Blue Mountains.

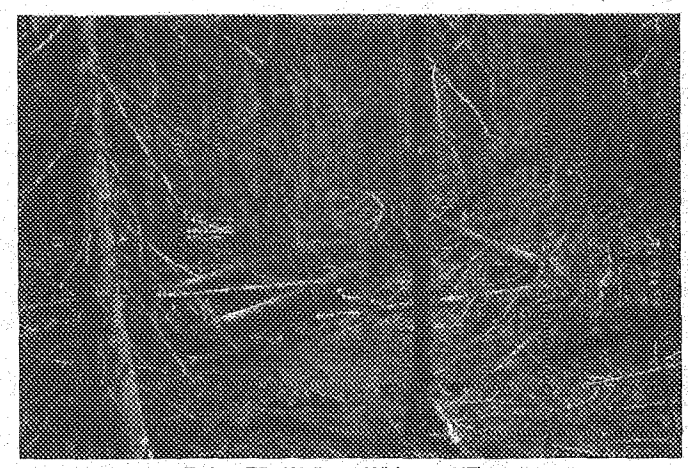
Typal Comparisons: The ABLA2/CLUN plant association was found between 4600-5600 ft., the lowest occurring member of the ABLA2 series. Sites supporting this type will have many of the mesic-site plants (i.e., VASI, VIOR2) with queen's cup beadlily (CLUN) conspicuous and dominant in the forb-layer. Tree productivities and basal areas are second highest within the series only to the ABLA2/TRCA3 plant association.

Successional Relationships: Early seral stands are dominated with big huckleberry. With increasing canopy closure the huckleberries decline; late seral stands are more forb-dominated. Lodgepole pine is seral on slopes less than 15%. Larch is the primary seral tree species on slopes steeper than 15%. Disturbance is indicated by patches of heartleaf arnica (ARCO) and golden-pea (THMO). Swamp gooseberry (RILA) in abundance (above 5%) is indicative of past disturbance attributed to livestock overgrazing.

Management Considerations: A wide range of silvicultural alternatives is possible to meet varied resource objectives. Concerns for water table levels, windthrow, insect and disease problems, and animal damage to seedlings are a few considerations for management plans. Wildlife and cattle may use these sites for thermal cover during late summer. Big huckleberry and gooseberry provide food for grouse and bear. Huckleberry cover may be reduced by machine scarification. The subalpine fir and spruce are fire-susceptible species because of thin bark; fire, though infrequent, could lead to stand replacement by early seral trees, PICO and LAOC.

Relationship to Other Studies: Similar to ABLA2/PAMY h.t. in north Idaho (Daubenmire 1968), the Okanogan National Forest (Williams and Lilybridge - 1983). Pfister, et al (1977) described ABLA2/CLUN in western Montana; Cooper et al (1987) re-defined ABLA2/PAMY as ABLA2/CLUN in north Idaho; Steele (1981) described ABLA2/CLUN in central Idaho; and Johnson and Simon described the type in the Wallowa-Snake (1987). Hall (1973) did not recognize the type in the Blue-Ochoco Mtns; incorporating this vegetation instead with the ABLA2/VAME pct.

Subalpine fir/twinflower plant association
Abies lasiocarpa/Linnaea borealis
ABLA2/LIBO2 (CES4 14)



Dutch Flat Creek (Baker RD, Wallowa-Whitman NF)

Table of Principal Species (n = 6)

Species	Code	Mean Cov (%)	Cons. (%)	Range
subalpine fir	ABLA2	27	100	15-45
Engelmann spruce	PIEN	30	100	7-50
lodgepole pine	PICO	13	66	2-20
western larch	LAOC	15	33	15-15
grouse huckleberry	VASC	23	100	2-40
big huckleberry	VAME	10	66	1-20
twinflower	LIBO2	13	100	1-40
prince's pine	CHUM	4	66	1-8
Oregon boxwood	PAMY	2	83	1-3
Columbia brome	BRVU	2	50	1-5
northwestern sedge	CACO	1	66	1-2
round leaved violet	VIOR2	2	100	1-3
heartleaf arnica	ARCO	2	83	1-4
sidebells pyrola	PYSE	3	83	1-5
mitella	MIST2	1	66	1-1
woods strawberry	FRVE	1	50	1-1

ENVIRONMENT
Location: North, central
Elevation: 5110 - 5830 ft. (5388 ft.)
Aspect: All aspects
Slope: 2-24% (10%)
Terrain features: Lower 1/3 of slope, toeslope, or bottom positions on all surfaces in steep, rolling to undulating terrain.
Soil Depth: 36-56 in. (45 in.)
Ash Depth: 14-32 in. (24 in.)
Surface soil textures: loam, silt loam
Subsurface soil textures: loam, silt loam, silt
Coarse fragments: 11-43% (22%)
Parent material: Colluvium and alluvium of igneous rocks with a mantle of volcanic ash.

UTILIZATION RESPONSE
D - PAMY, BRVU
IP - CACO
IU - VAME, VASC, LIBO2, ARCO
INV - -

STAND AND OVERSTORY ATTRIBUTES (n=5)
HERBAGE PRODUCTION (LBS/ACRE AIR DRY): 20-275 (98)
TOTAL BASAL AREA (SQ FT/ACRE): 45-101 (72)
TREE CANOPY COVERAGE (%): 45-101 (72)
STAND GBA (SQ FT/ACRE): 139-209 (169)

SPECIES	NO. PLOTS	BASAL AREA	AGE	SITE INDEX	GBA	PROD. INDEX
ABLA2	4	62/21	105/40	79/25	166/60	54/9
PIEN	5	57/41	126/48	83/23	192/49	69/31
LAOC	2	85/191	150/515	83/153	181/25	66/127

Veg. Composition: Spruce and subalpine fir are co-dominant with a shrubby understory usually dominated by huckleberries (VASC, VAME) with twinflower creeping at the ground surface. Common forbs are roundleaved violet, heartleaf arnica, and sidebells pyrola. Oregon boxwood (PAMY) is often present; but at lower coverages due to browsing pressure.

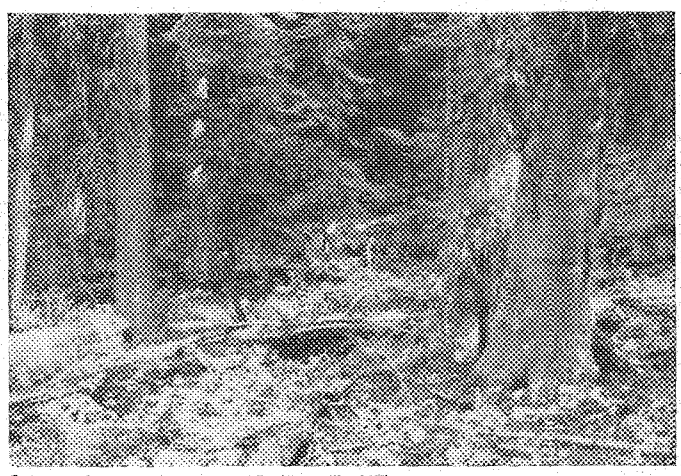
Typal Comparisons: Shrubs that dominate the understory (VAME and VASC) occur widely within the ABLA2 series. The subshrub, twinflower (LIBO2), dominates the ground cover. Queens cup beadlily is absent. Sites supporting this association are intermediate in moisture status, elevation, and productivities between ABLA2/VAME and ABLA2/CLUN.

Successional Relationships: As succession advances, the huckleberries tend to decline with increasing coverage by twinflower. Lodgepole pine usually precedes ABLA2 on slopes less than 15%; western larch and Douglas-fir are seral on steeper slopes. Grouse huckleberry, reflecting cold air drainage tolerance, is especially prevalent through mid seral stages. Oregon boxwood is often present in early seral stands.

Management Considerations: Silvicultural options are varied dependent upon successional stage and objectives. Constraints to management of this type may occur when the site is adjacent to streamcourses or use by animals is high. Following regeneration activities, subsequent animal use by livestock and big game could damage seedlings. The huckleberries provide food for grouse and bear. Machine scarification reduces canopy coverage of these shrubs. Understory herbage production is the lowest of the ABLA2 series. Fire here is infrequent but PICO and LAOC can dominate stands following intense fires.

Relationship to Other Studies: Daubenmire (1968) incorporated stands of ABLA2/LIBO2 in ABLA2/PAMY in northern Idaho; Cooper, et al (1987) incorporated ABLA2/LIBO2 in ABLA2/CLUN. Pfister, et al (1977), Steele (1981), Steele (1983), Williams and Lilybridge (1983), Williams, et al (1991), Clausnitzer and Zamora (1987), and Johnson and Simon (1987) all defined ABLA2/LIBO2 in their classifications. Hall (1973) did not describe ABLA2/LIBO2; Blue-Ochoco Mtn. plots were separated into the ABLA2/VAME and ABLA2/VASC pcts based on dominance of the huckleberries.

Subalpine fir/fool's huckleberry plant association
Abies lasiocarpa/Menziesia ferruginea
ABLA2/MEFE (CES2 21)



Spruce Spring (Pomeroy RD, Umatilla NF)

Table of Principal Species (n = 2)

Species	Code	Mean Cov (%)	Cons. (%)	Range
subalpine fir	ABLA2	60	100	36-36
Engelmann spruce	PIEN	13	100	12-13
western larch	LAOC	3	50	3-3
fool's huckleberry	MEFE	28	100	20-35
big huckleberry	VAME	28	100	25-30
heartleaf arnica	ARCO	25	100	10-40
sidebells pyrola	PYSE	18	100	15-20
Piper's anemone	ANPI	2	100	1-3
skunkleaved polemonium	POPUC	1	100	1-1
meadowrue	THOC	2	100	1-3
sweet cicely	OSCH	1	100	1-1
rattlesnake plantain	GOOB	4	100	3-5
violet	VIOLA	4	100	3-5

ENVIRONMENT
Location: North
Elevation: 5740 - 5900 ft. (5820 ft.)
Aspect: Northerly
Slope: 15-60% (38%)
Terrain features: Upper 1/3 of slope on all surfaces in steep rough to rolling terrain.
Parent material: Colluvium of igneous rocks with a mantle of volcanic ash.

UTILIZATION RESPONSE
D - PAMY, BRVU
IP - CACO
IU - VAME, VASC, LIBO2, ARCO
INV - -

STAND AND OVERSTORY ATTRIBUTES (n=2)
HERBAGE PRODUCTION (LBS/ACRE AIR DRY):
TOTAL BASAL AREA (SQ FT/ACRE): 176-215 (196)
TREE CANOPY COVERAGE (%): 60-88 (74)
STAND GBA (SQ FT/ACRE): 216-231 (224)

SPECIES	NO. PLOTS	BASAL AREA	AGE	SITE INDEX	GBA	PROD. INDEX
ABLA2	2	132/553	104/172	89/216	248/756	93/57

This plant association is described based on the similarities of the vegetation in the northern Blue Mountains to that described by investigators in northern Idaho, central Idaho, and in the Wallowas of northeastern Oregon.

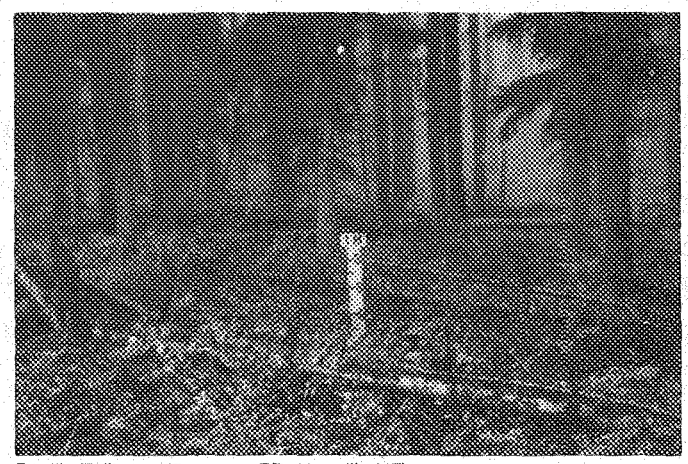
Veg. Composition: The subalpine fir/fool's huckleberry plant association was encountered only on the Pomeroy Ranger District where it occupied north-facing slopes at high elevations. It appears to occupy sites with late snowbank retention and cool, moist summer environments. Spruce and subalpine fir are highly associated. Big huckleberry is the principal shrub beneath the taller fool's huckleberry. Cool site forbs of prominence are skunkleaved polemonium (POPUC), false bugbane (TRCA3), sickletop lousewort (PERA), and western twayblade (LICA3).

Typal Comparisons: The dominance of fool's huckleberry (MEFE) in the tall shrub layer differentiates this plant association from others within the subalpine fir series.

Management Considerations: Western larch and lodgepole pine may be favored by tree overstory removal. Both fool's huckleberry and big huckleberry, and possibly Sitka alder, will respond with tree overstory harvest. Tree regeneration and establishment may be slowed by resulting shrubfields. Partial overstory harvest may modify exposed sites and retain spruce and fir. Elk use these cool, shaded north slope communities for thermal cover, hiding cover, and food. Shrubs regenerate profusely following burning. The ABLA2/MEFE community has a low fire periodicity.

Relationship to Other Studies: ABLA2/MEFE occurs in central Idaho (Daubenmire 1968; Steele 1981), northern Idaho (Cooper, et al 1987), western Montana (Pfister, et al 1977). It was described as a plant association in the Wallowas and Seven Devils Mountains by Johnson and Simon (1987). This plant community was not described previously in the Blue Mountains.

Subalpine fir/big huckleberry plant association
Abies lasiocarpa/Vaccinium membranaceum
ABLA2/VAME (CES3 11)



Devil's Tailbone (Pomeroy RD, Umatilla NF)

Table of Principal Species (n = 9)

Species	Code	Mean Cov (%)	Cons. (%)	Range
subalpine fir	ABLA2	40	100	7-65
Engelmann spruce	PIEN	12	77	5-40
lodgepole pine	PICO	6	55	1-15
western larch	LAOC	7	55	1-20
big huckleberry	VAME	31	100	5-80
grouse huckleberry	VASC	32	66	7-60
prince's pine	CHUM	3	44	1-8
heartleaf arnica	ARCO	10	77	3-30
violet	VIOLA	2	66	1-7
white hawkweed	HIAL	1	66	1-2
sidebells pyrola	PYSE	2	55	1-3
Piper's anemone	ANPI	3	44	1-7

ENVIRONMENT
Location: North, central
Elevation: 4800 - 6440 ft. (5849 ft.)
Aspect: All aspects
Slope: 3-120% (19%)
Terrain features: Ridgetop, upper, or middle 1/3 of slope on flat or convex surfaces in steep, rough to rolling, or undulating terrain.
Soil Depth: 22-48 in. (39 in.)
Ash Depth: 15-36 in. (24 in.)
Surface soil textures: sandy loam, loam, silt loam
Subsurface soil textures: sandy loam, loam, silt loam, silt
Coarse fragments: 5-42% (30%)
Parent material: Residuum and colluvium of sedimentary and igneous rocks, most with a mantle of volcanic ash.

UTILIZATION RESPONSE
D - -
IP - HIAL
IU - VAME, VASC, ARCO
INV - -

STAND AND OVERSTORY ATTRIBUTES (n=9)
HERBAGE PRODUCTION (LBS/ACRE AIR DRY): 50-650 (216)
TOTAL BASAL AREA (SQ FT/ACRE): 92-165 (130)
TREE CANOPY COVERAGE (%): 23-73 (57)
STAND GBA (SQ FT/ACRE): 94-159 (129)

SPECIES	NO. PLOTS	BASAL AREA	AGE	SITE INDEX	GBA	PROD. INDEX
ABLA2	7	71/32	148/30	55/10	114/29	26/7
PIEN	4	20/17	153/106	61/19	168/52	44/15
LAOC	2	32/73	137/299	65/64	116/413	31/140
PICO	3	50/59	115/17	65/10	107/64	30/24

Veg. Composition: Engelmann spruce is usually associated with subalpine fir. Big huckleberry and grouse huckleberry are dominant shrubs with colder microsites occupied by VASC and warmer microsites occupied by VAME; forbs are usually sparse.

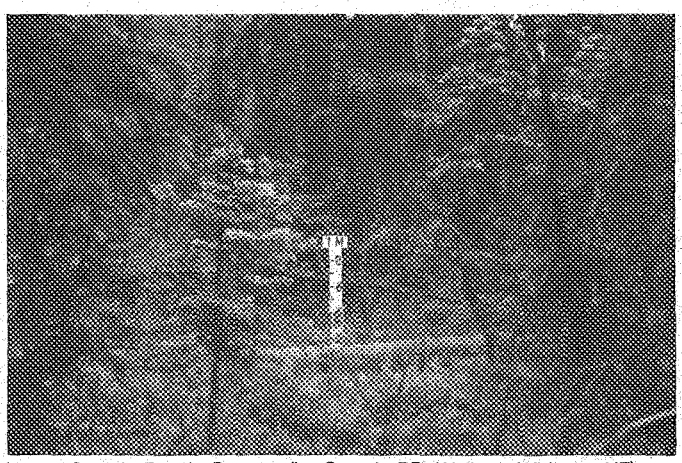
Typal Comparisons: The ABLA2/VAME association occupies cold, exposed, moist sites above 5000 ft. The understory is dominated by big huckleberry; the mesic-site plants, queen's cup beadlily and twinflower are absent. Basal areas and tree productivities are among the lowest for the series.

Successional Relationships: Lodgepole pine generally precedes subalpine fir when slopes are less than 15%; western larch and Douglas-fir are seral tree species on steeper slopes. Grouse huckleberry pioneers in very early seral stands and helps ameliorate the site for succession to big huckleberry. Heartleaf arnica (ARCO) and trail plant (ADBI) tend to colonize in patches when ABLA2/VAME is disturbed.

Management Considerations: Cold, exposed sites constrain silvicultural options for this plant association. Snow depths and cold make PIPO and PSME unsuitable for regeneration. Silvicultural systems to promote ABLA2, PIEN, LAOC, and PICO are appropriate. Huckleberries provide food for wildlife; these shrubs decrease with ground scarification. Sites provide thermal/hiding cover for deer and elk. The understory herbage production is principally composed of the less palatable forbs; grasses and sedges are scarce. Fire can create lodgepole pine and larch dominated stands; the fire-susceptible subalpine fir and spruce succumb not only to crown fires but also creeping surface fires.

Relationship to Other Studies: Daubenmire did not recognize a big huckleberry type in north Idaho. The type was first described by Hall (1973) in the Blue Mtns. Steele (1981, 1983) described ABLA2/VAGL in central and eastern Idaho. Williams (1983) and Williams, et al (1991) have described similar vegetation in northern Washington State. Clausnitzer and Zamora (1987) define an ABLA2/VACCI which predominantly consists of big huckleberry. Johnson and Simon (1987) classified ABLA2/VAME in the Wallowa-Snake.

Subalpine fir/grouse huckleberry plant association
Abies lasiocarpa/Vaccinium scoparium
ABLA2/VASC (CES4 11)



Upper Grande Ronde Canyon (La Grande RD, Wallowa-Whitman NF)

Table of Principal Species (n = 6)

Species	Code	Mean Cov (%)	Cons. (%)	Range
subalpine fir	ABLA2	31	100	6-60
Engelmann spruce	PIEN	18	83	2-45
lodgepole pine	PICO	10	66	3-21
western larch	LAOC	4	50	3-6
Douglas-fir	PSME	11	33	2-20
big huckleberry	VAME	1	33	1-1
grouse huckleberry	VASC	42	100	7-75
Oregon boxwood	PAMY	3	50	2-3
prince's pine	CHUM	3	33	3-3
pink mountain heath	PHEM	11	33	2-20
elk sedge	CAGE	3	33	2-3
Ross' sedge	CARO	2	33	1-2
pinegrass	CARU	6	33	4-7
sidebells pyrola	PYSE	3	66	1-5
mitella	MIST2	3	66	2-3
sweet cicely	OSCH	2	66	1-3
broadpetal strawberry	FRVI	3	66	1-4
heartleaf arnica	ARCO	7	33	5-8
Sitka valerian	VASI	1	33	1-1
violets	VIOLA	4	33	3-4

ENVIRONMENT
Location: North, central, south
Elevation: 5300-7500 ft. (6433 ft.)
Aspect: All aspects
Slope: 1-50% (12%)
Terrain features: Ridgetop, upper, middle, or lower 1/3 of slope, or toeslope positions on all surfaces in steep, rolling, undulating, or flat terrain.
Soil Depth: 36-48 in. (42 in.)
Ash Depth: 10-24 in. (16 in.)
Surface soil textures: Very fine sandy loam, loam
Subsurface soil textures: loamy sand, very fine sandy loam, loam
Coarse fragments: 18-52% (37%)
Parent material: Residuum and colluvium of igneous rocks with a mantle of volcanic ash or loess.

UTILIZATION RESPONSE
D - PAMY, CAGE
IP - CARO, OSCH, CARU
IU - VAME, VASC, FRVI, ARCO
INV - -

STAND AND OVERSTORY ATTRIBUTES (n=6)
HERBAGE PRODUCTION (LBS/ACRE AIR DRY): 25-125 (68)
TOTAL BASAL AREA (SQ FT/ACRE): 82-193 (135)
TREE CANOPY COVERAGE (%): 42-82 (60)
STAND GBA (SQ FT/ACRE): 88-176 (133)

SPECIES	NO. PLOTS	BASAL AREA	AGE	SITE INDEX	GBA	PROD. INDEX
ABLA2	8	37/32	118/36	66/20	168/75	44/17
PIEN	6	77/74	145/40	76/20	178/70	57/27
LAOC	3	11/3	168/19	66/40	117/76	30/34
PICO	5	117/136	148/22	61/16	127/34	30/9
PSME	2	56/203	100/445	73/140	165/953	56/419

Veg. Composition: Engelmann spruce is highly associated with subalpine fir as a long-term seral species. Grouse huckleberry dominates the shrub and herb layers. Herbaceous plants are usually sparse. Ross' sedge and elk sedge may occur. Sidebells pyrola (PYSE), mitella (MIST2), and sweet cicely (OSCH) are common. Pink mountain heath (PHEM) is a very cold tolerant plant that associates at subalpine elevations with ABLA2/VASC communities.

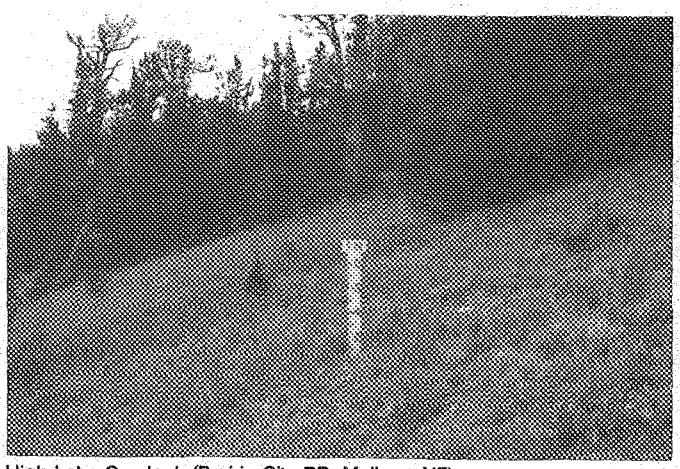
Typal Comparisons: Sites representing this plant association are characterized by cold, exposed, relatively droughty conditions at upper elevations. The understory is dominated by the low shrub, grouse huckleberry---associated vegetation is rather depauperate under closed stand conditions. Overstory productivities and basal areas are among the lowest of the ABLA2 series.

Successional Relationships: Lodgepole pine is seral to ABLA2 on slopes less than 15%; larch and Douglas-fir are seral to ABLA2 on steeper slopes. Grouse huckleberry is abundant through all stages of succession due to the harshness of sites. ABLA2/VASC sites are too cold for big huckleberry to colonize and persist. Spruce dominated stands assigned to ABLA2/VASC may contain dense tree canopy coverages resulting in depauperate understories where mitella (MIST2) and violets constitute the most abundant herbaceous growth.

Management Considerations: Cold temperatures of upper elevations or artificially created cold-air dams, snowpack, and potential late summer soil drought are concerns for timber management. Lodgepole pine and larch are favored by recurrent fire. The understory shrubs and forbs resprout following fire, yet may be reduced by machine scarification. Stands of this association provide thermal and hiding cover for elk and deer as well as food for grouse and bear.

Relationship to Other Studies: Defined by Daubenmire (1968); Hall (1973); Pfister, et al (1977); Steele (1981, 1983); Cooper, et al (1987); Williams and Lilybridge (1983); Williams, et al (1991); and Johnson and Simon (1987).

Subalpine fir/elk sedge plant association
Abies lasiocarpa/Carex geyeri
ABLA2/CAGE (CAG1 11)



High Lake Overlook (Prairie City RD, Malheur NF)

Table of Principal Species (n = 8)

Species	Code	Mean Cov (%)	Cons. (%)	Range
subalpine fir	ABLA2	19	100	3-40
whitebark pine	PIAL	19	75	2-50
lodgepole pine	PICO	9	37	3-16
mountain gooseberry	RIMO	7	37	3-15
elk sedge	CAGE	42	100	5-95
western needlegrass	STOC	3	50	1-7
bottlebrush squirreltail	SIHY	1	62	1-3
phlox	PHLOX	8	75	1-20
yarrow	ACMIL	4	50	1-7
alpine fleeceflower	POPH	4	37	2-7
skunkleaved polemonium	POPUC	3	37	1-5
white hawkweed	HIAL	6	37	3-7
sandwort	ARENA	4	37	1-7

ENVIRONMENT
Location: Central, south
Elevation: 6850 - 7800 ft. (7316 ft.)
Aspect: Southerly exposure
Slope: 4-50% (22%)
Terrain features: Ridgetop or upper 1/3 of slope on flat to convex surfaces in steep, rough to rolling terrain.
Soil Depth: 24-44 in. (32 in.)
Ash Depth: None
Surface soil textures: sandy loam, loam, silt
Subsurface soil textures: sandy loam
Coarse fragments: 35-70% (47%)
Parent material: Residuum of igneous, sedimentary, and metamorphic rock.

UTILIZATION RESPONSE
D - CAGE
IP - HIAL
IU - STOC, SIHY, PHLOX, POPUC
INV - POPH, ERFL

STAND AND OVERSTORY ATTRIBUTES (n=8)
HERBAGE PRODUCTION (LBS/ACRE AIR DRY): 200-600 (334)
TOTAL BASAL AREA (SQ FT/ACRE): 150
TREE CANOPY COVERAGE (%): 10-70 (37)
STAND GBA (SQ FT/ACRE): 110

SPECIES	NO. PLOTS	BASAL AREA	AGE	SITE INDEX	GBA	PROD. INDEX
ABLA2	4	135/111	122/45	70/11	175/115	51/25
PICO	4	33/34	108/62	69/23	172/81	48/13

Veg. Composition: High elevation, cold, dry habitats. Subalpine fir dominates in absence of spruce due to the droughtiness of the sites. The dominant herbaceous plant is elk sedge. Sites are too cold to support pinegrass which requires warmer, moister conditions to compete and persist with elk sedge.

Typal Comparisons: The dominance of elk sedge is typical of sites supporting this plant association. The occurrence of whitebark pine indicates the upper subalpine forest zone. Tree form is typical here (not Krummholz) and layering becomes important for tree regeneration. Elevations are among the highest of the series.

Successional Relationships: Whitebark pine and/or lodgepole pine are seral to fir. Whitebark pine may be long term co-dominant. Dissemination and germination of whitebark pine is assisted by Clark's nutcrackers. Overgrazing by domestic sheep has resulted in colonization by western needlegrass (STOC) and bottlebrush squirreltail (SIHY). Forbs increasing from overgrazing are, yarrow (ACMIL), phlox, and penstemons. Golden buckwheat (ERFL) and alpine fleeceflower (POPH) may invade severely disturbed sites.

Management Considerations: The severe environment of cold, exposed, and droughty sites with a short growing season may limit timber management opportunities. Resource values related to wildlife, watershed, aesthetics, and recreation are high for stands of this type. The loss of whitebark pine to insects and white pine blister rust is a management consideration.

Relationship to Other Studies: Pfister, et al (1977) and Steele (1981, 1983) have described ABLA2/CAGE habitat types in Montana and Idaho. Hall (1973) described ABLA2-PIAL/CAGE in the Blue Mountains.

Subalpine fir/heartleaf arnica plant community type
Abies lasiocarpa/Arnica cordifolia
ABLA2/ARCO (no code)

Veg. Composition: *This plant community type occupies* relatively cool, moderate slopes. Engelmann spruce is usually present with subalpine fir. Big huckleberry is the dominant shrub. Heartleaf arnica is the principal herbaceous plant with other forbs occurring in limited abundance.

Typal Comparisons: A similar successional stage has been identified beneath grand fir (ABGR/ARCO). The ABLA2/ARCO pct contains species of cooler, moister environments (i.e., *Columbia brome, round leaved violet, Piper's* anemone, skunkleaved polemonium) whereas the ABGR/ARCO pct occupies drier, warmer sites as reflected by elk sedge, *hawkweeds, pinegrass, and woods strawberry.*

Successional Relationships: The ABLA2/ARCO pct is an early seral stage of the ABLA2/TRCA3 plant association. The environmental, soils, and tree characteristics data are summarized with the description of the ABLA2/TRCA3 plant association.

Management Considerations: Treat similarly to ABLA2/TRCA3 plant association vegetation.

Utilization Response:
D - BRVU
IP - TRCA3, THOC
IU - POPUC, VAME, ARCO
INV - -

Relationship to Other Studies: The ABLA2/ARCO h.t. in Idaho (Steele 1981), Montana (Pfister, *et al* 1977), *and western* Wyoming (Steele 1983) is apparently unique to the northern Rocky Mountains where soils form principally from quartsites. *The ABLA2/ARCO pct in the Blue-Ochoco Mtn.* area occurs on volcanic ash. The pct was not previously described by Hall (1973) or Johnson and Simon (1987) in the Blue, Ochoco, or Wallowa Mtns.

Table of Principal Species (n = 5)

Species	Code	Mean Cov (%)	Cons. (%)	Range
subalpine fir	ABLA2	46	100	25-80
Engelmann spruce	PIEN	12	100	3-25
western larch	LAOC	7	60	3-10
lodgepole pine	PICO	4	40	3-5
big huckleberry	VAME	4	80	1-7
Columbia brome	BRVU	4	40	1-7
heartleaf arnica	ARCO	21	100	2-40
roundleaved violet	VIOR2	2	60	1-2
Piper's anemone	ANPI	4	80	1-5
mitella	MIST2	2	80	1-3
skunkleaved polemonium	POPUC	2	60	1-2
false bugbane	TRCA3	1	60	1-2
sidebells pyrola	PYSE	3	40	2-3
meadowrue	THOC	2	40	1-3
bedstraw	GATR	2	40	1-2

Subalpine fir/western needlegrass plant community type
Abies lasiocarpa/Stipa occidentalis
ABLA2/STOC (CAG4)

This plant community type represents an early seral stage of the ABLA2/CAGE plant association. Environmental, soils and tree characteristics are summarized with the ABLA2/CAGE plant association description.

Veg. Composition: This plant community type occurs on high elevation, cold, dry habitats. Subalpine fir dominates with lodgepole pine usually present. Scattered mountain big sagebruch (ARTRV) and mountain gooseberry (RIMO) may occur. Herbaceous vegetation, predominantly sedge-grass stands, is dominated by western needlegrass (STOC). Elk sedge (CAGE), Ross' sedge (CARO), and bottlebrush squirreltail (SIHY) are often associated.

Successional Relationships: The ABLA2/STOC pct is considered an early seral stage of the ABLA2/CAGE plant association. Lodgepole pine is nearly always present as a part of the forested overstory. Past overgrazing has created the current communities characterized by relict mats of elk sedge with relatively abundant stands of western needlegrass (STOC), and bottlebursh squirreltail (SIHY). Erosion pavement and bare ground average almost 50% of the surface coverage on these sites.

Management Considerations: These high elevation communities are very difficult to rehabilitate. The potential to establish and increase elk sedge may have been lost from soil erosion. Further investigation and experimentation in subalpine communities are needed to determine the options available for management to improve these sites.

Utilization Response:
D - CAGE
IP - CARO, OSCH, PENST (Sheep)
IU - STOC, SIHY, THOC
INV - -

Relationship to Other Studies: The ABLA2/STOC pct has not been previously described.

Table of Principal Species (n = 5)

Species	Code	Mean Cov (%)	Cons. (%)	Range
subalpine fir	ABLA2	38	100	15-60
whitebark pine	PIAL	1	25	1-1
lodgepole pine	PICO	9	100	3-20
mountain gooseberry	RIMO	4	50	2-5
mountain big sagebrush	ARTRV	2	50	1-3
elk sedge	CAGE	3	100	1-5
Ross' sedge	CARO	2	50	1-3
western needlegrass	STOC	6	100	3-7
bottlebrush squirreltail	SIHY	21	50	1-40
violets	VIOLA	2	50	1-3
meadowrue	THOC	1	50	1-1
sweet cicely	OSCH	1	50	1-1
penstemon	PENST	1	50	1-1

Lodgepole pine (subalpine fir)/grouse huckleberry plant community type
Pinus contorta (Abies lasiocarpa)/Vaccinium scoparium
PICO(ABLA2)/VASC (CLS4)

Veg. Composition: This pct occupies gentle slopes (less than 20%) at high elevations (6000 - 7500 ft.). Lodgepole pine dominates the tree overstory. Subalpine fir is always present in the tree regeneration. Engelmann spruce is usually associated. Grouse huckleberry is the dominant understory plant. Early seral shrubs often accompanying the huckleberry are pinemat manzanita (ARNE) and Oregon boxwood (PAMY). Forb composition is weak.

Typal Comparisons: Similar to PICO (ABLA2)/VAME. Depicts the colder, more frost-prone subalpine fir sites with seral dominance by lodgepole pine. The PICO/CARU plant association has a good component of grouse huckleberry but can not support subalpine fir due to frost resulting from cold air ponding in winter.

Successional Relationships: The PICO (ABLA2)/VASC plant community type is successional to the ABLA2/VASC plant association. See the ABLA2/VASC plant association descriptions for the environmental, soils, and tree characteristics summary.

Management Considerations: Cold temperatures of upper elevations or air-impoundments, snowpack, and potential soil drought are concerns for timber management. Lodgepole pine is favored by recurrent fire. The understory shrubs and forbs resprout following fire, yet may be reduced by machine scarification. Stands of this association provide thermal and hiding cover for elk and deer as well as food for grouse and bear.

Relationship to Other Studies: The PICO/VASC pct successional to subalpine fir was described by Pfister, et al (1977), Steele (1981, 1983), Johnson and Simon (1987). Hall (1973) described this pct in the Blue Mountains as well.

Table of Principal Species (n = 7)

Species	Code	Mean Cov (%)	Cons. (%)	Range
lodgepole pine	PICO	31	100	20-60
subalpine fir	ABLA2	7	100	3-20
grand fir	ABGR	4	28	1-7
Engelmann spruce	PIEN	6	71	1-20
grouse huckleberry	VASC	51	100	20-80
Oregon boxwood	PAMY	2	57	1-3
pinemat manzanita	ARNE	2	42	1-3
northwestern sedge	CACO	2	28	1-3
heartleaf arnica	ARCO	4	85	1-7
white hawkweed	HIAL	1	71	1-3
sidebells pyrola	PYSE	2	28	1-3

Lodgepole pine (subalpine fir)/big huckleberry/pinegrass plant community type
Pinus contorta (Abies lasiocarpa)/Vaccinium membranaceum/Calamagrostis rubescens
PICO(ABLA2)/VAME/CARU (n = 2) (CLS5)

This pct is delineated from the PICO (ABLA2)/VAME plant communities based on pinegrass constancy. Other features differentiating this type are presence of elk sedge (CAGE) and white hawkweed (HIAL). It is also an early seral stage of the ABLA2/VAME plant association. Big huckleberry is the dominant shrub with grouse huckleberry also present. The herbaceous layer is dominated by pinegrass (CARU) with heartleaf arnica (ARCO) the most noteable of the forbs. Slopes are gentle with elevations averaging 5400 ft.

The PICO (ABLA2)/VAME/CARU pct. has not been described previously.

The environmental, soils, and tree characteristics data are summarized with the description of the ABLA2/VAME plant association.

Lodgepole pine (subalpine fir)/big huckleberry plant community type
Pinus contorta (Abies lasiocarpa)/Vaccinium membranaceum
PICO(ABLA2)/VAME (n = 2) (CLS5)

The PICO/VAME plant community type portrays a lodgepole pine-dominated early seral stage of the ABLA2/VAME plant association. Subalpine fir, Engelmann spruce and western larch are usually associated with the lodgepole pine. Big huckleberry dominates the ground beneath the pines with scant coverage provided by forbs. Violets and Piper's anemone (ANPI) are present. Heartleaf arnica (ARCO) usually occurs as well. Slopes are gentle with elevations usually below 6000 ft. The PICO/VAME site is warmer than the PICO/VASC site.

The PICO/VAME plant community type successional to subalpine fir was described by Pfister, et al (1977) and Steele (1981, 1983) using the closely allied V. *globulare*. It was described in the Wallowa Mtns. by Johnson and Simon (1987).

The environmental, soils, and tree characteristics data are summarized with the description of the ABLA2/VAME plant association.

Subalpine fir/white rhododendron plant communities
Abies lasiocarpa/Rhododendron albiflorum
ABLA2/RHAL (n = 1)

The ABLA2/RHAL plant community is relatively scarce in the Blue Mountains. The type location is in the Elkhorn Range of Baker Ranger District at 6200 feet white rhododendron is known from the Blue Mtns. but is much more prevalent in the Cascades of Oregon and Washington. Both subalpine fir and Engelmann spruce dominate the tree coverage. The shrub-dominated understory is comprised of white rhododendron and grouse huckleberry. The most prominant forbs are heartleaf arnica (ARCO) and sidebells pyrola (PYSE). Further subalpine ecological investigation may provide further understanding of the environments which promote the ABLA2/RHAL plant communities.

Subalpine fir-whitebark pine/alpine fleeceflower plant communities
Abies lasiocarpa-Pinus albicaulis/Polygonum phytolaccaefolium
ABLA2-PIAL/POPH (n = 3) (CAF2)

These steep slope subalpine plant communities are unstable from periodic natural disturbance (snowslides, snow water runoff, boulder falls) as well as domestic sheep overgrazing. Subalpine fir is usually associated with lodgepole pine and whitebark pine. Tenacious plants capable of withstanding the disturbance dominate (fleeceflower, sandwort, western needlegrass). Penstemon and golden buckwheat (ERFL) often colonize these sites.

Subalpine fir-whitebark pine/Drummond's rush plant communities
Abies lasiocarpa-Pinus albicaulis/Juncus drummondii
ABLA2-PIAL/JUDR (n = 2) (CAG3)

Gentle subalpine slopes dominated by subalpine fir with Drummond's sedge herbaceous layer constitute this plant community type. Successional relationships are unclear. Lodgepole pine and whitebark are often associated. Disturbed areas of these communities contain alpine fleeceflower and western needlegrass.

Subalpine fir-whitebark pine/skunkleaved polemonium plant communities
Abies lasiocarpa-pinus albicaulus/Polemonium pulcherrimum
ABLA2-PIAL/POPU (n = 2) (CAF0)

A high elevation, cold, dry plant community with low tree canopy coverage by subalpine fir and whitebark pine. Sites are often rocky where the dominant skunkleaved polemonium (POPU) dominates among a scattering of various forbs. Mountain gooseberry (RIMO) and grouse huckleberry (VASC) are usually present in low abundance.

Lodgepole pine (subalpine fir)/elk sedge plant communities
Pinus contorta (Abies lasiocarpa)/Carex geyeri
PICO(ABLA2)/CAGE (n = 1)

This high elevation plant community type may be successional to the subalpine fir/elk sedge plant association. More investigation is needed to understand the ecological placement of these communities in the subalpine plant association classification.

Lodgepole pine and mountain big sagebrush (ARTRV) dominate with presence by elk sedge (CAGR), Ross' sedge (CARO), and needlegrass (STOC). The high elevation of these sites precludes the assignment to grand fir.

Lodgepole pine(subalpine fir)/Western needlegrass plant communities
Pinus contorta(Abies lasiocarpa)/Stipa occidentalis
PICO(ABLA2)/STOC (n = 1)

This represents a lodgepole pine - dominated early seral stage of the subalpine fir/elk sedge plant association. Western needlegrass is abundant from degrading of the subalpine rangeland by domestic sheep overuse early in the century. The native elk sedge composition has been lost. Only Ross' sedge (CARO) and sandwort (ARENA) are prevalent. The bare ground surface (40%) attests to plant loss and harshness of the site for re-colonization by herbaceous plants.

Grand fir/oakfern plant association
Abies grandis/Gymnocarpium dryopteris
ABGR/GYDR (CWF6 11)

Tiger Creek (Walla Walla RD, Umatilla NF)

Table of Principal Species (n = 4)

Species	Code	Mean Cov (%)	Cons. (%)	Range
grand fir	ABGR	55	100	45-70
Engelmann spruce	PIEN	9	75	3-20
Douglas-fir	PSME	10	50	10-10
western larch	LAOC	3	50	1-5
Rocky Mtn. maple	ACGL	13	100	1-40
swamp gooseberry	RILA	2	100	1-3
Pacific yew	TABR	20	75	1-50
thimbleberry	RUPA	22	75	1-60
big huckleberry	VAME	8	50	1-15
common snowberry	SYALL	1	75	1-1
Columbia brome	BRVU	3	50	1-5
oakfern	GYDR	30	100	20-40
foamflower	TITRU	20	100	8-25
queen's cup beadlily	CLUN	9	100	1-15
trail plant	ADBI	5	100	1-10
starry Solomon's seal	SMST	9	100	1-15
round leaved violet	VIOR2	3	100	2-3
bedstraw	GATR	3	75	1-5
rattlesnake plantain	GOOB	1	75	1-1
sweet cicely	OSCH	3	75	1-5
baneberry	ACRU	4	75	1-10
Hooker's fairy bells	DIHO	37	75	15-50
ginger	ASCA3	8	75	3-15
heartleafed arnica	ARCO	5	75	1-10
Piper's anemone	ANPI	4	50	2-5
lady fern	ATFI	10	50	10-10
false bugbane	TRCA3	4	50	2-5
sword fern	POMU	7	50	3-10

ENVIRONMENT
LOCATION: North
ELEVATION: 3220-4480 ft. (3935 ft.)
ASPECT: Northerly exposures
SLOPE: 35-55% (45%)
TERRAIN FEATURES: Upper to lower 1/3 of slope on all surfaces in steep, rough terrain.
PARENT MATERIAL: Residuum and colluvium of igneous rocks with volcanic ash mantle.

UTILIZATION RESPONSE
D - BRVU, TRCA3
IP - OSCH, RUPA
IU - ARCO, THOC, ACRU
INV - -

STAND AND OVERSTORY ATTRIBUTES (n=3)
HERBAGE PRODUCTION (LBS/ACRE AIR DRY): 350-480 (426)
TOTAL BASAL AREA (SQ FT/ACRE): 142-193 (173)
TREE CANOPY COVERAGE (%): 67-75 (68)
STAND GBA (SQ FT/ACRE): 235-317 (283)

SPECIES	NO. PLOTS	BASAL AREA	AGE	SITE INDEX	GBA	PROD. INDEX
ABGR	3	136/124	144/87	121/45	298/47	153/68

Veg. Composition: A relatively low elevation plant association occupying warm, moist habitats created by the maritime climate. Grand fir dominates with spruce usually associated. Rocky Mtn. maple (ACGL), swamp gooseberry (RILA) and Pacific yew (TABR) are usually present. The herbaceous layer is comprised of species indicative of this type requiring cool, moist conditions. Prominent among these species are oakfern (GYDR), queen's cup beadlily (CLUN), tiarella (TITRU), trail plant (ADBI), Hooker's fairybells (DIHO), ginger (ASCA3), and lady fern (ATFI).

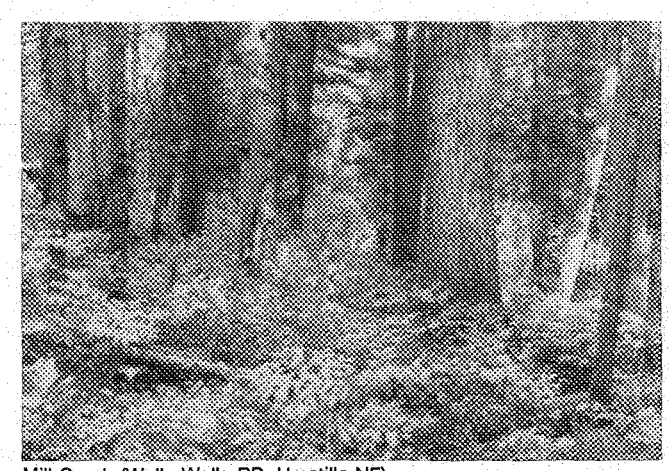
Typal Comparisons: Prevalence of moist-site forbs and ferns is characteristic of stands representing the ABGR/GYDR association. Oakfern (GYDR) and Hooker's fairy bells (DIHO) dominate this layer. This is the lone association of the grand fir series where GYDR is abundant. Sites appear to be highly productive for timber management in height growth and stocking level.

Successional Relationships: Western larch and Douglas-fir precede grand fir. Disturbance generally promotes heartleaf arnica (ARCO), sweet cicely (OSCH), meadowrue (THOC), and baneberry (ACRU).

Management Considerations: Proximity to watercourses limits silvicultural options on some sites. Where this association occurs on upland sites, mesic site conditions are a concern for timber management and road building activities. These conditions may be ameliorated by consideration of silvicultural system, season of operation, and transportation alternatives. Seral tree species include Douglas-fir, western larch, and Engelmann spruce. Stands are susceptible to windthrow, fire, defoliating insects, as well as root and stem diseases.

Relationship to Other Studies: The ABGR/GYDR plant association has not been previously described. It is given plant association status on the weight of similar communities observed but not sampled in the northern Blue Mountains.

Grand fir/sword fern - ginger plant association
Abies grandis/Polystichum munitum - Asarum caudatum
ABGR/POMU-ASCA3 (CWF6 12)



Mill Creek (Walla Walla RD, Umatilla NF)

Table of Principal Species (n = 14)

Species	Code	Mean Cov (%)	Cons. (%)	Range
grand fir	ABGR	60	100	30-90
Douglas-fir	PSME	14	42	5-30
western larch	LAOC	6	28	1-15
Engelmann spruce	PIEN	6	28	1-15
Rocky Mtn. maple	ACGL	9	100	1-40
twinflower	LIBO2	19	71	1-65
baldhip rose	ROGY	3	92	1-15
common snowberry	SYALL	18	64	1-65
swamp gooseberry	RILA	2	64	1-5
thimbleberry	RUPA	6	85	1-30
syringa	PHLE2	6	50	1-20
red alder	ALRU	8	42	1-25
Pacific yew	TABR	5	35	3-8
Columbia brome	BRVU	5	100	1-15
sword fern	POMU	12	85	1-40
queen's cup beadlily	CLUN	10	100	1-20
ginger	ASCA3	15	92	1-45
Hooker's fairybells	DIHO	31	85	3-60
foamflower	TITRU	28	78	1-60
starry Solomon's seal	SMST	15	100	1-60
western starflower	TRLA2	3	57	1-5
woods strawberry	FRVE	3	71	1-10
bedstraw	GATR	3	78	1-10
trail plant	ADBI	3	85	1-15
baneberry	ACRU	2	71	1-3
round leaved violet	VIOR2	4	85	1-13

ENVIRONMENT
LOCATION: North
ELEVATION: 2560-4675 ft. (3143 ft.)
ASPECT: All aspects
SLOPE: 2-85% (44%)
TERRAIN FEATURES: Primarily middle, or lower 1/3 of slope, toeslope or bottom positions on flat, convex, or concave surfaces in steep, rough to rolling terrain.
SOIL DEPTH: 96 in.
ASH DEPTH: 40 in.
SURFACE SOIL TEXTURES: Silt loam, silt
SUBSURFACE SOIL TEXTURES: Silt loam, silt
COARSE FRAGMENTS: 22%
PARENT MATERIAL: Residuum, colluvium, and alluvium of igneous rocks with ash mantle.

UTILIZATION RESPONSE
D - BRVU
IP - SYALL, RUPA, PHMA
IU - FRVE, ACRU
INV - -

STAND AND OVERSTORY ATTRIBUTES (n = 12)
HERBAGE PRODUCTION (LBS/ACRE AIR DRY): 70-750 (436)
TOTAL BASAL AREA (SQ FT/ACRE): 130-318 (202)
TREE CANOPY COVERAGE (%): 45-90 (72)
STAND GBA (SQ FT/ACRE): 126-379 (237)

SPECIES	NO. PLOTS	BASAL AREA	AGE	SITE INDEX	GBA	PROD. INDEX
ABGR	12	164/36	132/27	107/12	243/45	116/30
LAOC	2	37/172	174/407	124/140	200/261	110/267
PIEN	2	18/32	121/13	107/229	423/1093	192/89

Veg. Composition: Low elevation sites, on steep, northerly slopes near canyon bottoms support this type of the northern Blue Mountains. Grand fir is associated with Rocky Mtn. maple and a wealth of shrubs. Common snowberry (SYAL) and twinflower (LIBO2) are usually abundant. Herbaceous vegetation is dominated by sword fern (POMU), ginger (ASCA3), queen's cup beadlily (CLUN), Hooker's fairybells (DIHO), foamflower (TITRU) and starry Solomon's seal (SMST). The sword fern - ginger community reflects the influence of the warm, maritime climate in the northern Blue Mountains and a species composition more common in the Cascades.

Typal Comparisons: The presence of Rocky Mtn. maple and Pacific yew here are not indicative of those types using these species as indicators. The indicators of ABGR/POMU-ASCA3 are the sword fern-ginger herbs which reflect the environment as a warm, maritime climate. The associated flora is more common to the west side of the Cascades than to the Blue Mtns.

Successional Relationships: Douglas-fir and larch are seral to grand fir. Reflecting the drier canyon slope influence from adjacent communities are ninebark (PHMA), oceanspray (HODI), and woods strawberry (FRVE). Wet conditions of the riparian bottoms provide red alder (ALRU), Pacific yew (TABR), and black cottonwood (POTR3) incursions. Shrublands of Rocky Mountain maple (ACGL), big huckleberry (VAME), scouler willow (SASC), and Sitka alder (ALSI) may dominate in early seral stages following burns.

Management Considerations: The riparian nature of this type limits silvicultural opportunities. Appropriate systems should consider wildlife, watershed, aesthetic, recreational, and biological diversity values inherent to sites supporting the ABGR/POMU-ASCA3 association. A diverse habitat is provided bear, deer, elk, grouse, and passerines. Thermal cover for ungulates during summer months may be provided. Forage production for domestic stock is low, although herbage production is high within these wet drainages.

Relationship to Other Studies: This plant association has not been previously described in the Blue Mountains. Crawford and Johnson (1985) described an ABGR/TABR/ASCA3 habitat type in northern Idaho. Cooper, et al (1987) described an ABGR/ASCA3 habitat type with a TABR phase as occurring solely on the Nez Perce National Forest in Idaho.

Grand fir/false bugbane plant association
Abies grandis/Trautvettaria caroliniensis
ABGR/TRCA3 (CWF5 12)

North Fork Touchet Canyon (Pomeroy RD, Umatilla NF)

Table of Principal Species (n = 16)

Species	Code	Mean Cov (%)	Cons. (%)	Range
grand fir	ABGR	54	100	1-90
Engelmann spruce	PIEN	14	93	2-32
subalpine fir	ABLA2	3	37	1-12
western larch	LAOC	6	62	1-15
lodgepole pine	PICO	3	18	2-5
big huckleberry	VAME	5	93	1-15
thimbleberry	RUPA	2	43	1-3
Pacific yew	TABR	3	43	1-10
Pacific common snowberry	SYALL	9	37	1-35
Rocky Mtn. maple	ACGL	3	31	1-8
twinflower	LIBO2	5	31	1-10
Columbia brome	BRVU	3	93	1-10
false bugbane	TRCA3	8	100	2-45
meadowrue	THOC	5	100	1-10
bedstraw	GATR	3	81	1-8
Piper's anemone	ANPI	3	93	1-8
violets	VIOLA	3	81	1-6
woods strawberry	FRVE	2	75	1-6
starry Solomon's seal	SMST	3	81	1-10
foam flower	TITRU	5	75	1-20
heartleaf arnica	ARCO	5	62	1-15
sweet cicely	OSCH	3	75	1-5
skunkleaved polemonium	POPUC	3	50	1-8
trail plant	ADBI	5	68	1-15
queen's cup beadlily	CLUN	4	62	1-10
wartberry fairybells	DITR	4	62	1-10

ENVIRONMENT
LOCATION: North
ELEVATION: 4000-5130 ft. (4654 ft.)
ASPECT: All aspects
SLOPE: 5-75% (16%)
TERRAIN FEATURES: Principally middle, or lower 1/3 of slope, toeslope, or bottom positions on all surfaces in undulating or flat terrain.
SOIL DEPTH: 46-76 in. (61 in.)
ASH DEPTH: 17-26 in. (21 in.)
SURFACE SOIL TEXTURES: Very fine sandy loam, loam, silt loam
SUBSURFACE SOIL TEXTURES: Very fine sandy loam, silt loam, silt, silty clay loam, clay loam, clay
COARSE FRAGMENTS: 6-31% (17%)
PARENT MATERIAL: Residuum, colluvium, and alluvium of igneous rocks with ash mantle.

UTILIZATION RESPONSE
D - BRVU, TRCA3
IP - RUPA, OSCH
IU - VAME, THOC, FRVE, ARCO
INV - VIAM, LUPIN, THMO, PTAQ, ANMA, VACA

PRODUCTION AND OVERSTORY ATTIRBUTES (n=14)
HERBAGE PRODUCTION (LBS/ACRE AIR DRY): 75-600 (353)
TOTAL BASAL AREA (SQ FT/ACRE): 160-279 (206)
TREE CANOPY COVERAGE (%): 40-106 (74)
STAND GBA (SQ FT/ACRE): 185-356 (249)

SPECIES	NO. PLOTS	BASAL AREA	AGE	SITE INDEX	GBA	PROD. INDEX
ABGR	13	153/39	148/27	108/8	279/43	128/22
LAOC	5	22/17	150/69	110/9	202/65	94/31
PIEN	11	53/27	141/34	108/5	226/36	107/18

Veg. Composition: A cool, moist community of the northern Blue Mountains where grand fir and spruce dominate on slopes with big huckleberry (VAME) and false bugbane (TRCA3). The forb composition is high with a variety of mesic site plants usually present - meadowrue (THOC), starry Solomon's seal (SMST), tiarella (TITRU), trail plant (ADBI), queen's cup beadlily (CLUN), and Columbia brome (BRVU). The presence of subalpine fir and spruce indicate close affinity to cooler subalpine fir series environmental conditions.

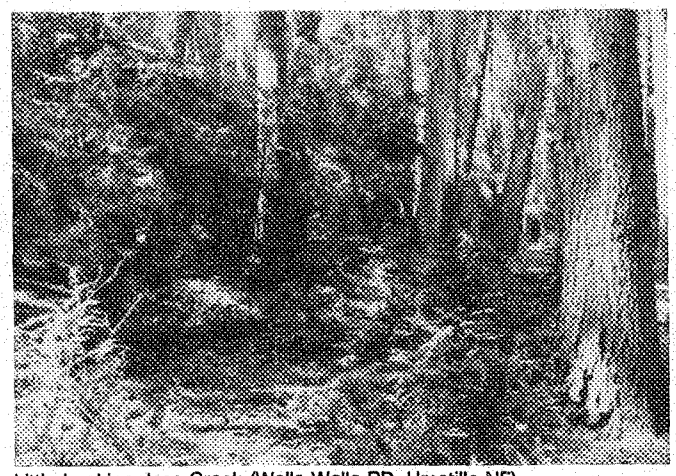
Typal Comparisons: Pacific yew is commonly present in small amounts; false bugbane is the most prevalent and abundant forb within this type. The ABGR/TRCA3 occurs on colder sites than ABGR/POMU-ASCA3.

Successional Relationships: Western larch is seral to grand fir. Lodgepole pine may pioneer on some sites. Prior to tree occupancy, shrublands may occur with dominant plants being big huckleberry (VAME), thimbleberry (RUPA), Rocky Mountain maple (ACGL), red osier dogwood (COST), and Sitka alder (ALSI). Soil surface disturbance may promote heartleaf arnica (ARCO), strawberries (FRVI, FRVE), vetch (VIAM), lupines, bracken (PTAQ), golden pea (THMO), pearly everlasting (ANMA), false hellebore (VECA) and coneflower (RUOC).

Management Considerations: On streamside sites supporting this type, silvicultural alternatives for timber management are limited. Upland sites are less restrictive. These mesic, cool areas may be used as big game thermal cover during warm summer months. Associated shrubs provide food for grouse and bear. Fire favors lodgepole pine and larch over grand fir and Engelmann spruce.

Relationship to Other Studies: This plant association has not been described previously. More subalpine investigation in the Intermountain Pacific Northwest may provide additional ABGR/TRCA3 descriptions.

Grand fir/Pacific yew/queen's cup beadlily plant association
Abies grandis/Taxus brevifolia/Clintonia uniflora
ABGR/TABR/CLUN (CWC8 11)



Little Lookingglass Creek (Walla Walla RD, Umatilla NF)

Table of Principal Species (n = 11)

Species	Code	Mean Cov (%)	Cons. (%)	Range
grand fir	ABGR	60	100	32-80
Engelmann spruce	PIEN	10	81	4-20
Douglas-fir	PSME	7	54	3-10
western larch	LAOC	1	27	1-2
Pacific yew	TABR	23	100	2-60
twinflower	LIBO2	23	90	3-65
prince's pine	CHUM	4	81	1-15
big huckleberry	VAME	16	72	1-60
baldhip rose	ROGY	3	72	1-7
Columbia brome	BRVU	2	72	1-5
queen's cup beadlily	CLUN	12	100	1-25
trail plant	ADBI	10	72	1-40
violets	VIOLA	2	63	1-4
Piper's anemone	ANPI	2	81	1-7
meadowrue	THOC	5	72	1-20
foamflower	TITRU	6	54	1-15
heartleaf arnica	ARCO	6	54	2-15
starry Solomon's seal	SMST	5	72	2-15
bedstraw	GATR	1	54	1-3
mitella	MIST2	2	63	1-4
sweet cicely	OSCH	2	81	1-3
woods strawberry	FRVE	2	54	1-3

ENVIRONMENT
LOCATION: North
ELEVATION: 3600-4900 ft. (4196 ft.)
ASPECT: All aspects
SLOPE: 10-55% (22%)
TERRAIN FEATURES: Middle, or lower 1/3 of slope, toeslope or bottom position on all surfaces in steep, rough to rolling or undulating terrain.
SOIL DEPTH: 40-100 in. (66 in.)
ASH DEPTH: 8-44 in. (26 in.)
SURFACE SOIL TEXTURES: very fine sand loam, loam, silt loam
SUBSURFACE SOIL TEXTURES: very fine sandy loam, loam, silt loam, silty clay loam
COARSE FRAGMENTS: 15-30% (22%)
PARENT MATERIAL: Residuum, colluvium, and alluvium of igneous rocks with ash mantle.

UTILIZATION RESPONSE
D - TABR
IP - ADBI, EPAN
IU - VAME, CLUN, THOC, ARCO
INV - PTAQ, THMO, ANMA

STAND AND OVERSTORY ATTRIBUTES (n=8)
HERBAGE PRODUCTION (LBS/ACRE AIR DRY): 200-300 (239)
TOTAL BASAL AREA (SQ FT/ACRE): 120-307 (214)
TREE CANOPY COVERAGE (%): 55-90 (72)
STAND GBA (SQ FT/ACRE): 151-400 (278)

SPECIES	NO. PLOTS	BASAL AREA	AGE	SITE INDEX	GBA	PROD. INDEX
ABGR	7	175/56	157/30	104/14	279/73	124/42
PIEN	5	32/16	149/60	100/19	238/119	100/65

Veg. Composition: Grand fir is associated with Pacific yew on moderately steep slopes. Spruce is usually present. The occurrence of queen's cup beadlily (CLUN), trail plant (ADBI), and starry Solomon's seal (SMST) is indication of a moist, cool environment.

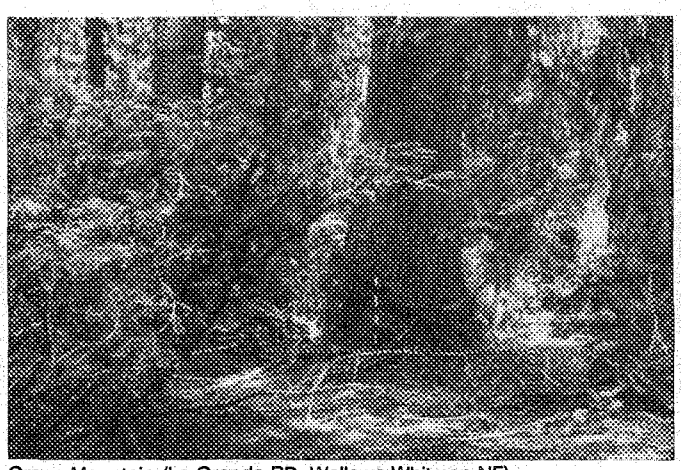
Typal Comparisons: This mesic association is distinguished from the ABGR/CLUN association by the conspicuous presence and abundance of the tall shrub, Pacific yew. Sites are cooler than those supporting Pacific yew in ABGR/POMU-ASCA3. The ABGR/TRCA3 plant association may contain TABR and is more mesic than ABGR/TABR/CLUN.

Successional Relationships: Douglas-fir and larch precede grand fir. Shrublands of sitka alder (ALSI), scouler willow (SASC), big huckleberry (VAME), thimbleberry (RUPA), and snowberry (SYAL) may dominate in early seral stages of succession. Disturbed sites may be dominated by bracken (PTAQ), fireweed (EPAN), golden pea (THMO) or pearly everlasting (ANMA).

Management Considerations: The proximity to watercourses may limit silvicultural options on some sites. When this association is found on the uplands, sites are very productive and silvicultural alternatives are more varied. TABR is sensitive to browsing by ungulates and damage by fire --cover will decline in these disturbance regimes. Complete overstory removal in dense canopied stands may result in reduced Pacific yew coverage; partial overstory removals may promote yew in the same stands. TABR provides habitat for passerines and browse for big game.

Relationship to Other Studies: Hall (1973) included TABR communities in the ABGR/VAME pct. Cooper, etal (1987) described an ABGR/CLUN habitat type with a yew phase on the Nez Perce National Forest. Johnson and Simon (1987) described ABGR/TABR/CLUN in the Wallowas.

Grand fir/Pacific yew - twinflower plant association
Abies grandis/Taxus brevifolia - Linnaea borealis
ABGR/TABR/LIBO2 (CWC8 12)



Green Mountain (La Grande RD, Wallowa-Whitman NF)

Table of Principal Species (n = 10)

Species	Code	Mean Cov./ Cons. (n=6)	(Depauperate) Mean Cov. /Cons. (n=4)	Range
grand fir	ABGR	68/100	78/100	35-80
Douglas-fir	PSME	12/67	7/50	1-35
Engelmann spruce	PIEN	8/50	12/75	3-20
western larch	LAOC	2/83	8/75	1-10
western white pine	PIMO	12/33	-	5-18
Pacific yew	TABR	9/100	6/100	3-15
twinflower	LIBO2	21/100	-	1-40
big huckleberry	VAME	6/83	2/75	1-20
prince's pine	CHUM	4/67	1/25	1-6
baldhip rose	ROGY	2/50	-	1-3
Oregon boxwood	PAMY	2/83	1/50	1-3
Columbia brome	BRVU	1/33	3/50	1-4
heartleaf arnica	ARCO	2/33	2/25	1-3
mitella	MIST2	4/67	2/50	2-6
Piper's anemone	ANPI	2/33	2/75	1-3
rattlesnake plantain	GOOB	2/50	1/50	1-3
sidebells pyrola	PYSE	4/50	3/25	3-6
pink wintergreen	PYAS	2/50	1/25	1-4

ENVIRONMENT
LOCATION: North, central
ELEVATION: 4080-5175 ft. (4764 ft.)
ASPECT: All aspects
SLOPE: 2-100% (18%)
TERRAIN FEATURES: Ridgetop, upper, or middle 1/3 of slope on all surfaces in undulating to flat terrain.
SOIL DEPTH: 40-96 in. (62 in.)
ASH DEPTH: 12-42 in. (28 in.)
SURFACE SOIL TEXTURES: Very fine sandy loam, silt loam
SUBSURFACE SOIL TEXTURES: Very fine sandy loam, loam, silt loam, sandy loam, clay
COARSE FRAGMENTS: 2-22% (11%)
PARENT MATERIAL: Residuum and colluvium of igneous rocks with a mantle of volcanic ash.

UTILIZATION RESPONSE
D - TABR, PAMY, BRVU
IP - -
IU - VAME, ARCO
INV - THMO, PTAQ, VIAM

STAND AND OVERSTORY ATTRIBUTES (n = 9)
HERBAGE PRODUCTION (LBS/ACRE AIR DRY): 25-275 (118)
TOTAL BASAL AREA (SQ FT/ACRE): 124-303 (200)
TREE CANOPY COVERAGE (%): 48-111 (89)
STAND GBA (SQ FT/ACRE): 103-406 (244)

SPECIES	NO. PLOTS	BASAL AREA	AGE	SITE INDEX	GBA	PROD. INDEX
ABGR	8	143/41	158/32	83/16	283/81	102/42
PIEN	4	38/7	167/89	101/11	168/86	64/41
LAOC	5	16/24	188/78	96/19	134/83	58/32
PSME	3	33/53	170/66	78/29	239/233	83/114
PIMO	2	35/318	214/241	97/203	222/673	80/57

Veg. Composition: Grand fir and Pacific yew, with presence of twinflower, is indicative of cool, moist environmental conditions promoting this type. Big huckleberry (VAME) is usually present. Forbs are relatively few with low abundance. Reflecting the dense tree canopy are shade tolerant plants (i.e. - mitella (MIST2), rattlesnake plantain (GOOB), pyrolas). Less mesic than the environment defined by ABGR/TABR/CLUN. Depauperate stands were devoid of LIBO2 and had lower coverage by VAME.

Typal Comparisons: Pacific yew occurrence and abundance distinguishes this association from ABGR/LIBO2. The subshrub, twinflower, dominates the herbaceous layer in the absence of more mesic-site indicators such as CLUN, TRCA3, POMU, and ASCA3. This association is usually found on the uplands—the more mesic association, ABGR/TABR/CLUN, occurs downslope near drainage bottoms. The ABGR/TABR/LIBO2 is the least productive of the TABR types. Tree production is moderately high.

Successional Relationships: Western larch and Douglas-fir are seral to the grand fir in older stands. Western white pine may occur as late seral occupant. Shrubfields of Rocky Mountain maple (ACGL), Oregon boxwood (PAMY), snowberry (SYAL) and big huckleberry (VAME) may occur in earlier stages of succession. Disturbance sites may be dominated by golden pea (THMO), bracken (PTAQ) and vetch (VIAM).

Management Considerations: Silvicultural alternatives can be developed from a wide array of options dependent upon the successional status of stands and management objectives. Pacific yew will decline with fire and excessive browsing. Complete overstory removal in dense canopied stands may result in reduced coverage of TABR; partial overstory removals may promote TABR in the same stands. This shrub provides food and habitat for passerines and big game.

Relationship to Other Studies: Clausnitzer and Zamora (1987) described an ABGR/LIBO2 habitat type with a TABR phase in northeast Washington.

Grand fir/Rocky Mountain maple plant association
Abies grandis/Acer glabrum
ABGR/ACGL (CWS5 41)

Touchet Canyon (Walla Walla RD, Umatilla NF)

Table of Principal Species (n = 8)

Species	Code	Mean Cov (%)	Cons. (%)	Range
grand fir	ABGR	42	100	7-65
Engelmann spruce	PIEN	18	50	2-45
Douglas-fir	PSME	17	62	3-44
western larch	LAOC	10	62	2-30
western white pine	PIMO	20	12	20-20
Rocky Mtn. maple	ACGL	10	100	5-20
big huckleberry	VAME	7	100	1-15
baldhip rose	ROGY	4	87	1-8
Oregon boxwood	PAMY	3	62	1-8
twinflower	LIBO2	6	50	2-12
prince's pine	CHUM	2	50	1-4
thimbleberry	RUPA	5	62	2-8
Columbia brome	BRVU	2	87	1-5
heartleaf arnica	ARCO	6	100	2-20
bedstraw	GATR	3	87	1-5
meadowrue	THOC	4	87	1-15
Piper's anemone	ANPI	2	75	1-3
queen's cup beadlily	CLUN	4	75	1-6
sweet cicely	OSCH	3	62	2-4
mitella	MIST2	9	62	2-25
starry Solomon's seal	SMST	6	75	1-20
trail plant	ADBI	4	50	1-10
Hooker's fairybells	DIHO	9	50	1-30
wartberry fairybells	DITR	2	37	1-3
violets	VIOLA	2	75	1-4
woods strawberry	FRVE	2	75	1-5

ENVIRONMENT
LOCATION: North, central
ELEVATION: 3375-5236 ft. (4191 ft.)
ASPECT: All aspects
SLOPE: 8-80% (46%)
TERRAIN FEATURES: Lower 1/3 of slope, toeslope or bottom positions on all surfaces in steep, rough to rolling or undulating terrain.
SOIL DEPTH: 36-46 in. (41 in.)
ASH DEPTH: 16-29 in. (23 in.)
SURFACE SOIL TEXTURES: silt loam
SUBSURFACE SOIL TEXTURES: sand, silt loam
COARSE FRAGMENTS: 28-42 (34)
PARENT MATERIAL: Residuum, colluvium, and alluvium of igneous rocks, most with a mantle of ash.

UTILIZATION RESPONSE
D - BRVU, PAMY
IP - RUPA, OSCH
IU - VAME, ARCO, THOC
INV - VIAM, PTAQ, THMO

STAND AND OVERSTORY ATTRIBUTES (n=7)
HERBAGE PRODUCTION (LBS/ACRE AIR DRY): 150-500 (305)
TOTAL BASAL AREA (SQ FT/ACRE): 123-336 (187)
TREE CANOPY COVERAGE (%): 44-98 (71)
STAND GBA (SQ FT/ACRE): 127-392 (220)

SPECIES	NO. PLOTS	BASAL AREA	AGE	SITE INDEX	GBA	PROD. INDEX
ABGR	7	111/41	109/37	111/20	236/92	118/53
LAOC	3	66/178	158/156	106/55	172/299	75/100
PSME	3	65/12	91/21	114/55	175/162	91/124
PIEN	2	27/273	94/51	96/172	177/591	75/70

Veg. Composition: Grand fir dominates on mountain slopes with Rocky Mountain maple. Engelmann spruce may occur. Shrub layer also contains big huckleberry (VAME). Queen's cup beadlily (CLUN) and twinflower (LIBO2) are often associated.

Typal Comparisons: Less mesic than ABGR/POMU-ASCA3 of the low elevations in northern Blue Mountains. In the ABGR/ACGL plant association, the moist-site herbs, POMU and ASCA3, so prevalent in the ABGR/POMU-ASCA3, are absent. The tall shrub, Rocky Mountain maple, is typical of the physiognomy presented by stands of this association. Stands have high timber production capability.

Successional Relationships: Larch and Douglas-fir are seral to grand fir. Occasionally, ponderosa pine may pioneer when the type occurs on seepage sites adjacent to warmer, drier slopes. Shrubfields may precede tree emergence and are dominated by Rocky Mountain maple (ACGL), big huckleberry (VAME), common snowberry (SYAL), Oregon boxwood (PAMY), spiraea (SPBE), thimbleberry (RUPA), ninebark (PHMA), and/or oceanspray (HODI). Surface disturbance of the forest understory may promote heartleaf arnica (ARCO), strawberries (FRVI, FRVE), vetch (VIAM), fireweed (EPAN), bracken (PTAQ) or golden pea (THMO).

Management Considerations: Where this association occurs on the upland, opportunities for silvicultural treatments are varied; they are lessened when this type occurs as riparian stringers. Post-harvest tall and medium shrub responses indicate consideration of appropriate site preparation and conifer release methods for plantation establishment. The sites provide habitat for bear, grouse, big game, and passerines. Members of the understory readily sprout following fire. Douglas-fir, ponderosa pine, western white pine, larch, and spruce occur as seral trees.

Relationship to Other Studies: Steele (1981) described a ABGR/ACGL habitat type in central Idaho. Johnson and Simon (1987) described the ABGR/ACGL plant association in the Wallowas and Seven Devils.

Grand fir/queen's cup beadlily plant association
Abies grandis/Clintonia uniflora
ABGR/CLUN (CWF4 21)

Rainbow Creek RNA (Pomeroy RD, Umatilla NF)

Table of Principal Species (n = 19)

Species	Code	Mean Cov (%)	Cons. (%)	Range
grand fir	ABGR	57	100	15-99
Engelmann spruce	PIEN	10	68	1-20
western larch	LAOC	12	78	1-40
Douglas-fir	PSME	10	68	3-30
big huckleberry	VAME	9	89	1-65
baldhip rose	ROGY	2	78	1-9
prince's pine	CHUM	2	57	1-3
twinflower	LIBO2	8	52	1-20
common snowberry	SYAL	3	42	1-8
Columbia brome	BRVU	2	89	1-7
queen's cup beadlily	CLUN	5	100	1-15
mitella	MIST2	2	89	1-7
false Solomon's seal	SMST	3	89	1-10
sweet cicely	OSCH	2	84	1-5
bedstraw	GATR	3	84	1-10
trail plant	ADBI	5	78	1-25
white hawkweed	HIAL	2	68	1-4
heartleaf arnica	ARCO	7	52	1-20
violets	VIOLA	2	68	1-5
sidebells pyrola	PYSE	2	68	1-5
woods strawberry	FRVE	3	42	1-5
meadowrue	THOC	5	52	1-15
tiarella	TITRU	3	63	1-10

ENVIRONMENT
LOCATION: North, central, south
ELEVATION: 2640-6000 ft. (4492 ft.)
ASPECT: All aspects
SLOPE: 5-80% (30%)
TERRAIN FEATURES: Upper, middle, or lower 1/3 of slope on flat or convex surfaces in steep, rough to rolling, or undulating terrain.
SOIL DEPTH: 40-72 in. (54 in.)
ASH DEPTH: 5-28 in. (19 in.)
SURFACE SOIL TEXTURES: loamy sand, sandy loam, loam, silt loam
SUBSURFACE SOIL TEXTURES: loamy sand, sandy loam, loam, silt loam, silty clay loam, clay loam
COARSE FRAGMENTS: 4-70% (30%)
PARENT MATERIAL: Residuum and colluvium of igneous rocks with ash mantle.

UTILIZATION RESPONSE
D - BRVU
IP - SYAL, OSCH, ADBI, HIAL
IU - VAME, CLUN, ARCO
INV - VIAM, LUPIN, PTAQ, THMO, RUOC

STAND AND OVERSTORY ATTRIBUTES (n = 15)
HERBAGE PRODUCTION (LBS/ACRE AIR DRY): 80-375 (185)
TOTAL BASAL AREA (SQ FT/ACRE): 116-420 (253)
TREE CANOPY COVERAGE (%): 41-115 (83)
STAND GBA (SQ FT/ACRE): 148-367 (274)

SPECIES	NO. PLOTS	BASAL AREA	AGE	SITE INDEX	GBA	PROD. INDEX
ABGR	13	147/48	145/21	101/13	308/51	141/36
LAOC	10	78/48	112/36	117/12	247/38	126/34
PSME	3	73/126	169/121	87/35	247/129	92/100
PIEN	6	40/26	134/26	104/14	282/79	119/30

Veg. Composition: Grand fir occurs with spruce usually associated. Shrubs are few with big huckleberry (VAME), baldhip rose (ROGY) and twinflower (LIBO2) often present. The herbaceous layer contains a variety of plants adapted to cool, moist environments. Queen's cup beadlily (CLUN), starry Solomon's seal (SMST), trail plant (ADBI) and foam flower (TITRU) are indicative of this environment.

Typal Comparisons: The tall shrub, ACGL---indicative of the ABGR/ACGL association, is usually absent from the ABGR/CLUN type. VAME may occur but queen's cup beadlily beneath the scattered shrubs indicate the mesic-site conditions of this plant association. Sites have moderate soil depth and are among the highest for tree production in the Blue Mountains (ABGR/CLUN is very high in productive potential).

Successional Relationships: Western larch and Douglas-fir usually precede grand fir successionally. Principal shrubs which are promoted with surface disturbance on these sites are big huckleberry (VAME), common snowberry (SYAL), Oregon boxwood (PAMY), Rocky Mountain maple (ACGL), spiraea (SPBE), swamp gooseberry (RILA) and Scouler willow (SASC). Disturbance of the herbaceous layer may promote heartleaf arnica (ARCO), strawberries, vetch (VIAM), lupines, bracken (PTAQ), coneflower (RUOC) and golden pea (THMO).

Management Considerations: Silvicultural options to utilize the productive capabilities of these sites are varied dependent upon the successional status of stands and management objectives. Concern for competition with seedlings may be concentrated on seral shrubs promoted by ground disturbance and burning. Composition of late seral stands on some sites may lead to insect defoliation by spruce budworm or Douglas-fir tussock moth and pathogen problems, notably Indian paint fungus. Late seral and climax stands as well as densely canopied stands produce low amounts of forage for domestic livestock; stands are used for cover and browse by deer and elk. Huckleberries provide food for grouse and bear. Fire leads to dominance by seral tree species, lodgepole pine, Douglas-fir, or western larch. Engelmann spruce is a mid to late-seral tree.

Relationship to Other Studies: Pfister, et al (1977) described ABGR/CLUN with 3 phases in Montana. Steele (1981) and Cooper, et al (1987) described ABGR/CLUN in north central and central Idaho. Johnson and Simon (1987) described ABGR/CLUN as the most mesic of the grand fir series associations in the Wallowa-Snake classification.

Grand fir/twinflower plant association
Abies grandis/Linnaea borealis
ABGR/LIBO2 (CWF3 12)

Charley Creek (Pomeroy RD, Umatilla NF)

Table of Principal Species (n = 39)

Species	Code	Mean Cov (%)	Cons. (%)	Range
grand fir	ABGR	46	100	4-99
Engelmann spruce	PIEN	15	61	1-60
Douglas-fir	PSME	10	69	1-40
western larch	LAOC	13	64	1-40
lodgepole pine	PICO	8	38	1-35
subalpine fir	ABLA2	7	25	1-22
ponderosa pine	PIPO	4	12	1-7
white pine	PIMO	9	12	3-20
twinflower	LIBO2	12	100	1-40
big huckleberry	VAME	19	89	1-80
prince's pine	CHUM	3	82	1-20
baldhip rose	ROGY	4	64	1-20
Oregon boxwood	PAMY	2	46	1-20
grouse huckleberry	VASC	18	30	1-70
Columbia brome	BRVU	3	41	1-8
northwestern sedge	CACO	3	35	1-6
elk sedge	CAGE	5	28	1-35
pinegrass	CARU	5	25	1-20
sidebells pyrola	PYSE	2	64	1-6
rattlesnake plantain	GOOB	1	53	1-3
mitella	MIST2	3	53	1-7
heartleaf arnica	ARCO	7	48	1-40
white hawkweed	HIAL	2	48	1-5
violets	VIOLA	2	48	1-8
Piper's anemone	ANPI	2	46	1-5

ENVIRONMENT
LOCATION: North, central, south
ELEVATION: 2500-5750 ft. (4660 ft.)
ASPECT: All aspects
SLOPE: 2-110% (20%)
TERRAIN FEATURES: All slope positions on all surfaces in steep, rough to rolling, undulating, or flat terrain.
SOIL DEPTH: 27-96 in. (50 in.)
ASH DEPTH: 10-60 in. (24 in.)
SURFACE SOIL TEXTURES: sandy loam, silt loam, silt
SUBSURFACE SOIL TEXTURES: sandy loam, silt loam, silt, silty clay loam, clay loam
COARSE FRAGMENTS: 2-65% (26%)
PARENT MATERIAL: Residuum, colluvium, and alluvium of igneous and sedimentary rocks with ash and/or loess.

UTILIZATION RESPONSE
D - PAMY, BRVU, CAGE
IP - CACO, HIAL, ASTER, CARU
IU - VAME, ARCO
INV - EPAN, THMO

STAND AND OVERSTORY ATTRIBUTES (n=29)
HERBAGE PRODUCTION (LBS/ACRE AIR DRY): 45-600 (212)
TOTAL BASAL AREA (SQ FT/ACRE): 73-284 (171)
TREE CANOPY COVERAGE (%): 41-140 (77)
STAND GBA (SQ FT/ACRE): 49-292 (180)

SPECIES	NO. PLOTS	BASAL AREA	AGE	SITE INDEX	GBA	PROD. INDEX
ABGR	21	96/23	160/22	77/6	216/29	70/14
LAOC	15	49/22	146/23	88/8	151/33	53/17
PSME	9	29/13	141/36	64/13	172/32	47/20
PIEN	17	46/16	145/20	81/10	200/45	71/15
PICO	5	53/41	96/27	73/19	199/42	61/25
ABLA2	4	28/37	110/59	84/19	190/183	63/48
PIMO	4	29/26	161/43	104/32	212/108	93/72
PIPO	2	20/127	178/159	73/32	271/432	79/159

Veg. Composition: Grand fir is associated with Douglas-fir, larch, and spruce. Twinflower (LIBO2) is always present. Depending on tree canopy density, big huckleberry may dominate or be absent from ABGR/LIBO2 communities. Herbaceous vegetation is usually scattered at low coverage or in limited patches due to depauperate nature of many sites. The more prevalent shade-tolerant forbs are sidebells pyrola (PYSE), rattlesnake plantain (GOOB) and mitella (MIST2).

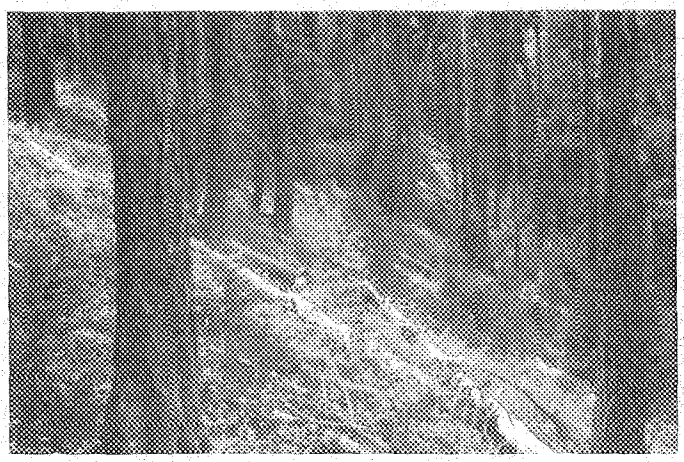
Typal Comparisons: This type, ABGR/VAME, does not have the subshrub, twinflower (LIBO2), present; VAME may be abundant within the ABGR/LIBO2 association. This type occurs on mid-elevation slopes with moderate ash depths and is perhaps the most widespread plant association of the Blue and Ochoco Mountains.

Successional Relationships: Western larch, lodgepole pine, ponderosa pine, and Douglas-fir are key seral tree species. The PICO/VAME-LIBO2 plant community type is assigned to this plant association. Early seral ABGR/LIBO2 communities may be dominated by shrubfields of big huckleberry (VAME), common snowberry (SYAL), spiraea (SPBE), or pinemat manzanita (ARNE). Disturbed forest understory may result in the promotion of heartleaf arnica (ARCO), pinegrass (CARU), elk sedge (CAGE), meadowrue (THOC), fireweed (EPAN), aster, golden pea (THMO).

Management Considerations: Silvicultural options for these sites are varied dependent upon the successional status of stands and management objectives. Seral shrubs and huckleberry may compete with tree seedlings during establishment following clearcutting. Composition of late seral stands, where tolerant grand fir dominates, promotes defoliation by spruce budworm and Douglas-fir tussock moth and pathogen problems (Indian paint fungus). The tree species, PSME, PICO, PIPO, and LAOC are favored by fire---ABGR is susceptible to fire. Little forage is available in late seral or climax stands; browse and cover are provided big game. Huckleberries are a food source for grouse and bear.

Relationship to Other Studies: The ABGR/LIBO2 plant association was described by Hall (1973) in the Blue Mountains, by Pfister, et al (1977) in Montana, by Steele (1981) in central Idaho, by Cooper, et al (1987) in N. Idaho, by Clausnitzer and Zamora (1987) in N. Washington, and by Johnson and Simon (1987) in the Wallowas and Seven Devils.

Grand fir/big huckleberry plant association
Abies grandis/Vaccinium membranaceum
ABGR/VAME (CWS2 12)



Butte Creek Basin (La Grande RD, Wallowa-Whitman NF)

Table of Principal Species (n = 11)

Species	Code	Mean Cov (%)	Cons. (%)	Range
grand fir	ABGR	30	100	7-95
Douglas-fir	PSME	9	64	1-26
western larch	LAOC	11	72	1-25
subalpine fir	ABLA2	11	55	2-25
big huckleberry	VAME	36	100	3-80
prince's pine	CHUM	3	82	1-5
Oregon boxwood	PAMY	2	55	1-3
baldhip rose	ROGY	1	36	1-2
pinegrass	CARU	9	36	1-15
elk sedge	CAGE	4	45	1-10
heartleaf arnica	ARCO	11	82	2-20
mitella	MIST2	2	64	1-3
sidebells pyrola	PYSE	3	64	1-8
rattlesnake plantain	GOOB	2	55	1-7
white hawkweed	HIAL	2	36	1-2
violets	VIOLA	2	36	1-3
Piper's anemone	ANPI	4	36	1-3

ENVIRONMENT
LOCATION: North, central, south
ELEVATION: 4425-6350 ft. (5370 ft.)
ASPECT: All aspects
SLOPE: 1-80% (26%)
SOIL DEPTH: 36-58 in. (46 in.)
ASH DEPTH: 5-24 in. (15 in.)
TERRAIN FEATURES: Upper or middle 1/3 of slope on all surfaces in steep, rough to rolling terrain.
SURFACE SOIL TEXTURES: sandy loam, loam, silt loam
SUBSURFACE SOIL TEXTURES: sandy loam, loam, silt loam, silt
COARSE FRAGMENTS: 10-68% (35%)
PARENT MATERIAL: Residuum, colluvium of igneous, and metamorphic rocks with ash mantle.

UTILIZATION RESPONSE
D - PAMY, CAGE
IP - HIAL, OSCH, CARU
IU - VAME, ARCO
INV - -

STAND AND OVERSTORY ATTRIBUTES (n = 7)
HERBAGE PRODUCTION (LBS/ACRE AIR DRY): 30-425 (213)
TOTAL BASAL AREA (SQ FT/ACRE): 103-200 (161)
TREE CANOPY COVERAGE (%): 43-95 (64)
STAND GBA (SQ FT/ACRE): 114-260 (181)

SPECIES	NO. PLOTS	BASAL AREA	AGE	SITE INDEX	GBA	PROD. INDEX
ABGR	8	46/35	127/49	71/12	183/55	56/25
LAOC	6	32/37	145/52	75/20	162/75	55/43
PSME	6	26/17	132/49	71/14	177/48	53/16
PIEN	3	52/91	155/78	88/63	178/140	69/89
ABLA2	5	17/14	129/68	79/31	204/132	71/76
PIPO	2	64/140	139/114	76/178	119/407	38/45
PICO	5	123/51	98/42	67/7	102/13	28/4

Veg. Composition: Grand fir dominates over a stand of abundant big huckleberry with a scarcity by the more mesic plant indiactors (i.e., CLUN, LIBO2). Forbs and other shrubs are minimally present. ABGR/VAME is one of the more common plant associations of the Blue-Ochoco Mountains.

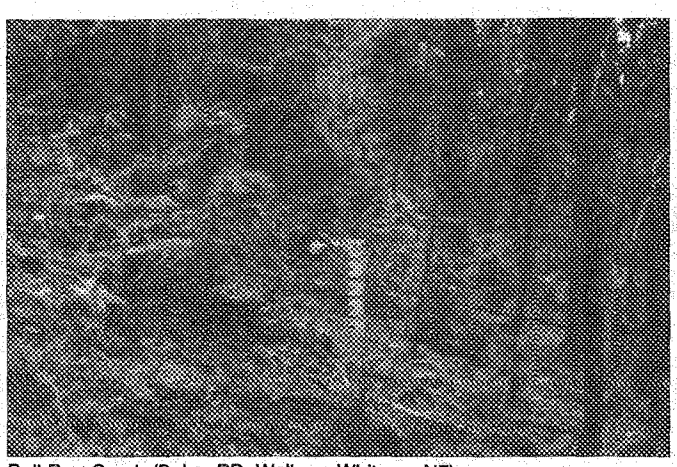
Typal Comparisons: The understory of the ABGR/VAME plant association is represented by the dominance of big huckleberry (VAME) and the absence of the more mesic-site plants, twinflower (LIBO2) and queen's cup beadlily (CLUN). Soil and ash depths, soil water-holding capacity, and tree productivities trend lower in this type than the mesic ABGR/LIBO2 and ABGR/CLUN. The ABGR/VAME occurs on exposed, cold, and drier sites than those supporting ABGR/LIBO2 or ABGR/CLUN.

Successional Relationships: Lodgepole pine, Douglas-fir and western larch are principal seral tree species. Three lodgepole pine dominated early seral plant community types (PICO/VAME, PICO/VAME/CARU, and PICO/VAME/PTAQ) are assigned to this plant association. Early seral stands may have abundant shrub coverages by big huckleberry (VAME), common snowberry (SYAL), spiraea (SPBE), pinemat manzanita (ARNE), and Scouler willow (SASC). Forbs which may be more prominent in early seral stages are heartleaf arnica (ARCO), woods strawberry (FRVE), sweet cicely (OSCH), and meadowrue (THOC). Pinegrass (CARU) may also be more abundant in lower seral stage communities or near the dry extreme for the type. Early seral stages are developed in ABGR/VAME by fire, logging, and ungulate use.

Management Considerations: Stands of the ABGR/VAME association are capable of supporting a broad range of silvicultural activities within the framework of resource value conservation. Steep slopes, competing herbaceous and shrub vegetation, and droughty sites are concerns for both natural and artificial regeneration activities. Douglas-fir, western larch, ponderosa pine, lodgepole pine, grand fir, and spruce are appropriate tree species for sites within this plant association. Grand fir and spruce are easily damaged by fire, but the understory recovers quickly. Stand replacement fires favor lodgepole pine, ponderosa pine, larch, and Douglas-fir. Spruce is a mid to late-seral species. Stands of this type provide food and hiding/thermal cover for wild ungulates, grouse, bear, and passerines.

Relationship to Other Studies: Described in the Blue Mtns. by Hall (1973); in central Idaho by Steele (1981), and in N. Idaho by Cooper, et al (1987) as an ABGR/VAGL habitat type; in the Wallowa and Seven Devils by Johnson and Simon (1987).

Grand fir/grouse huckleberry - twinflower plant association
Abies grandis/Vaccinium scoparium - Linnaea borealis
ABGR/VASC-LIBO2 (CWS8 12)



Bull Run Creek (Baker RD, Wallowa-Whitman NF)

Table of Principal Species (n = 14)

Species	Code	Mean Cov (%)	Cons. (%)	Range
grand fir	ABGR	41	100	1-90
Engelmann spruce	PIEN	25	50	3-55
Douglas-fir	PSME	9	71	1-25
western larch	LAOC	8	85	1-20
lodgepole pine	PICO	3	78	1-7
subalpine fir	ABLA2	4	28	1-12
twinflower	LIBO2	7	100	1-20
grouse huckleberry	VASC	18	100	1-60
big huckleberry	VAME	3	42	1-10
prince's pine	CHUM	6	71	1-20
Oregon boxwood	PAMY	2	57	1-3
pinemat manzanita	ARNE	7	42	1-15
Columbia brome	BRVU	1	28	1-1
elk sedge	CAGE	4	42	1-10
northwestern sedge	CACO	2	85	1-7
pinegrass	CARU	18	71	1-60
heartleaf arnica	ARCO	5	57	1-10
white hawkweed	HIAL	3	78	1-5
violets	VIOLA	2	50	1-3
sidebells pyrola	PYSE	3	71	1-10
rattlesnake plantain	GOOB	2	50	1-3
woods strawberry	FRVE	2	50	1-5
broadpetal strawberry	FRVI	2	42	1-3

ENVIRONMENT
LOCATION: Central, south
ELEVATION: 4230-6000 ft. (5179 ft.)
ASPECT: All aspects
SLOPE: 2-30% (16%)
TERRAIN FEATURES: All slope positions on flat, convex, or concave surfaces in steep, rolling or undulating terrain.
SOIL DEPTH: 34-48 in. (42 in.)
ASH DEPTH: 10-24 in. (19 in.)
SURFACE SOIL TEXTURES: Very fine sandy loam, loam, silt loam
SUBSURFACE SOIL TEXTURES: sandy loam, very fine sandy loam, loam, silt loam
COARSE FRAGMENTS: 9-45% (30%)
PARENT MATERIAL: Residuum, colluvium, and alluvium of igneous rocks with mantle of ash.

UTILIZATION RESPONSE
D - PAMY, BRVU, CAGE
IP - CACO, HIAL
IU - VAME, VASC, ARCO
INV - EPAN

STAND AND OVERSTORY ATTRIBUTES (n = 14)
HERBAGE PRODUCTION (LBS/ACRE AIR DRY): 30-500 (196)
TOTAL BASAL AREA (SQ FT/ACRE): 72-190 (151)
TREE CANOPY COVERAGE (%): 34-98 (70)
STAND GBA (SQ FT/ACRE) 50-264 (163)

SPECIES	NO. PLOTS	BASAL AREA	AGE	SITE INDEX	GBA	PROD. INDEX
ABGR	11	85/33	181/38	81/12	212/39	74/19
LAOC	9	33/20	188/36	93/8	109/30	44/12
PSME	6	31/16	194/44	78/13	168/939	51/15
PIEN	6	55/41	162/27	85/20	179/53	65/27
PICO	3	18/14	130/381	66/20	140/66	37/19
ABLA2	2	11/70	115/64	103/95	103/51	47/19

Veg. Composition: A cooler, more mesic community than the ABGR/VASC communities (as indicated by the presence of spruce and twinflower). Spruce and grand fir codominate in late seral stands. Twinflower and grouse huckleberry dominate the shrub layer with scarcity by big huckleberry. Forb, sedge, and grass coverage is low.

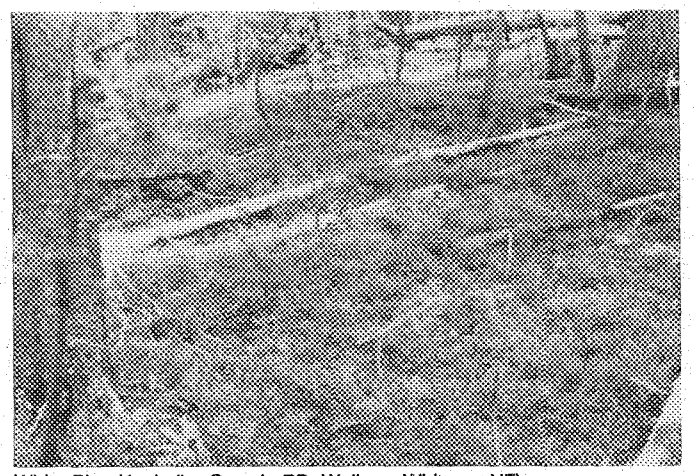
Typal Comparisons: Twinflower is well represented in this type. Sites for the grouse huckleberry associations within the ABGR series are similar—the ABGR/VASC plant association occurs on drier sites than the ABGR/VASC-LIBO2. Tree productivities are notably higher in ABGR/VASC/LIBO2 than in ABGR/VASC stands.

Successional Relationships: Lodgepole pine, western larch, and Douglas-fir are the principal seral tree species. Shrubs more prominent in early seral stages are pinemat manzanita (ARNE), thimbleberry (RUPA) and Oregon boxwood (PAMY). Forbs increasing in early seral stands are heartleaf arnica (ARCO), strawberries, meadowrue (THOC) and fireweed (EPAN). Elk sedge (CAGE) may also increase following disturbance.

Management Considerations: The occurrence of this type near the upper elevational limits for the ABGR series, the understory dominance of grouse huckleberry, and the occurrence of stands in cold-air drainages are factors to consider in the development of appropriate silvicultural alternatives. Cold soils and frost-prone sites are concerns for successful regeneration activities. PICO, LAOC, PIEN, and PSME are seral trees within this association. Stands provide habitat for wild ungulates, grouse, and bear. Fire promotes the establishment of lodgepole pine, western larch, and Douglas-fir. The understory, with the exception of twinflower, recovers relatively quickly following fire.

Relationship to Other Studies: Hall (1973) described ABGR/VASC in the Blue Mountains. This is the initial stratification of ABGR/VASC with a mesic component (defined by LIBO2).

Grand fir/grouse huckleberry plant association
Abies grandis/Vaccinium scoparium
ABGR/VASC (CWS8 11)



White Pine Knob (La Grande RD, Wallowa-Whitman NF)

Table of Principal Species (n = 13)

Species	Code	Mean Cov (%)	Cons. (%)	Range
grand fir	ABGR	31	100	8-60
Douglas-fir	PSME	15	76	1-40
western larch	LAOC	10	84	1-36
lodgepole pine	PICO	5	84	1-20
ponderosa pine	PIPO	8	61	1-32
grouse huckleberry	VASC	27	100	5-60
big huckleberry	VAME	2	38	1-8
prince's pine	CHUM	5	61	1-20
Oregon boxwood	PAMY	2	61	1-3
spiraea	SPBE	8	46	2-36
pinemat manzanita	ARNE	6	76	1-28
buffaloberry	SHCA	1	30	1-1
pinegrass	CARU	19	84	1-60
elk sedge	CAGE	5	61	1-13
northwestern sedge	CACO	4	53	1-15
white hawkweed	HIAL	3	61	1-7
heartleaf arnica	ARCO	5	53	1-15
woods strawberry	FRVE	2	46	1-3
broadpetal strawberry	FRVI	2	46	1-4

ENVIRONMENT
LOCATION: Central, south
ELEVATION: 4250-6320 ft. (5346 ft.)
ASPECT: Principally northerly exposures
SLOPE: 3-80% (17%)
TERRAIN FEATURES: Upper, middle, or lower 1/3 of slope on all surfaces in steep, rough to rolling, or undulating terrain.
SOIL DEPTH: 22-60 in. (40 in.)
ASH DEPTH: 8-26 in. (17 in.)
SURFACE SOIL TEXTURES: loamy sand, loam, silt loam
SUBSURFACE SOIL TEXTURES: loamy sand, loam, silt loam
COARSE FRAGMENTS: 21-54% (32%)
PARENT MATERIAL: Residuum or colluvium of igneous rocks most with a mantle of volcanic ash.

UTILIZATION RESPONSE
D - PAMY, CAGE
IP - CACO, HIAL, SYAL, CARU
IU - VASC, VAME, ARNE, ARCO, FRAGA, SPBE
INV- LUPIN, EPILOB

STAND AND OVERSTORY ATTRIBUTES (n = 10)
HERBAGE PRODUCTION (LBS/ACRE AIR DRY): 75-450 (247)
TOTAL BASAL AREA (SQ FT/ACRE): 60-180 (112)
TREE CANOPY COVERAGE (%): 39-82 (62)
STAND GBA (SQ FT/ACRE): 77-189 (118)

SPECIES	NO. PLOTS	BASAL AREA	AGE	SITE INDEX	GBA	PROD. INDEX
ABGR	9	61/36	117/53	75/23	152/20	41/9
LAOC	8	16/14	120/52	77/20	109/39	32/8
PSME	5	35/36	142/83	78/19	133/49	41/13
PIPO	4	19/25	171/119	86/35	77/11	29/14
PICO	10	120/44	97/21	71/10	133/24	40/14

Veg. Composition: This association characterizes the droughty extreme of grand fir associations in which VASC dominates the shrub layer. Pinegrass is the most abundant herbaceous plant.

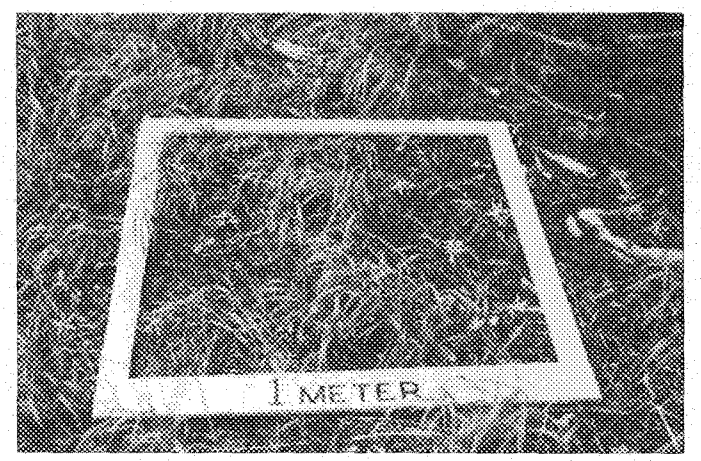
Typal Comparisons: This plant association is a drier grouse huckleberry community than ABGR/VASC-LIBO2 as indicated by lack of twinflower. Big huckleberry is limited (sites too cold and frost-prone to support it). Where PIEN and ABLA2 were associated in ABGR/VASC-LIBO2, PIPO and PSME are now principal seral tree species.

Successional Relationships: Western larch, lodgepole pine, Douglas-fir and ponderosa pine are seral tree species in these communities. Shrubs that increase with soil surface disturbance are pinemat manzanita (ARNE), spiraea (SPBE), common snowberry (SYAL). Herbs that increase following soil surface disturbance are heartleaf arnica (ARCO), strawberries, pinegrass (CARU), elk sedge (CAGE), northwestern sedge (CACO), lupines and fireweeds. Buffaloberry responds to burning and becomes more prominent in early successional stages.

Management Considerations: Cold soils, frost-prone sites, and droughty soils should be considered in the development of silvicultural activities. PICO, PIPO, LAOC, and PSME are seral trees within this type and may be promoted in silvicultural activities. Stands are used by wild ungulates, grouse, and bear.

Relationship to Other Studies: Hall (1973) described ABGR/VASC in the Blue Mountains.

Grand fir/Columbia brome plant association
Abies grandis/Bromus vulgaris
ABGR/BRVU (CWG2 11)



Whistler Spring (Prineville RD, Ochoco NF)

Table of Principal Species (n = 4)

Species	Code	Mean Cov (%)	Cons. (%)	Range
grand fir	ABGR	43	100	7-68
Douglas-fir	PSME	9	75	1-25
western larch	LAOC	10	75	1-20
Engelmann spruce	PIEN	7	50	3-10
grouse huckleberry	VASC	1	50	1-1
swamp gooseberry	RILA	1	75	1-2
Oregon boxwood	PAMY	1	50	1-1
Columbia brome	BRVU	21	100	15-24
elk sedge	CAGE	4	75	1-6
western fescue	FEOC	1	50	1-1
mitella	MIST2	4	100	2-7
white hawkweed	HIAL	2	75	1-3
sweet cicely	OSCH	4	75	1-8
sidebells pyrola	PYSE	2	75	1-3
bedstraw	GATR	5	75	1-12
columbine	AQFO	1	75	1-1
heartleaf arnica	ARCO	4	75	1-7
starry Solomon's seal	SMST	2	50	2-2
broadpetal strawberry	FRVI	2	50	1-3
skunkleaved polemonium	POPUC	11	50	2-20
lupine	LUPIN	21	50	6-36

ENVIRONMENT
LOCATION: Central, south
ELEVATION: 5050-5900 ft. (5638 ft.)
ASPECT: Northerly exposures
SLOPE: 3-100% (32%)
TERRAIN FEATURES: Upper or middle 1/3 of slope on all surfaces in undulating terrain.
SOIL DEPTH: 40-71 in. (53 in.)
ASH DEPTH: 14-28 in. (21 in.)
SURFACE SOIL TEXTURES: Sandy loam, silt loam
SUBSURFACE SOIL TEXTURES: Sandy loam, loam, silt loam, silt, colluvium
COARSE FRAGMENTS: 24-64% (39%)
PARENT MATERIAL: Residuum of igneous rocks with a mantle of ash.

UTILIZATION RESPONSE
D - PAMY, BRVU
IP - CAGE, FEOC
IU - FRVI, ARCO
INV - LUPIN

STAND AND OVERSTORY ATTRIBUTES (n = 4)
HERBAGE PRODUCTION (LBS/ACRE AIR DRY): 153-696 (401)
TOTAL BASAL AREA (SQ FT/ACRE): 136-292 (205)
TREE CANOPY COVERAGE (%): 52-69 (62)
STAND GBA (SQ FT/ACRE): 121-281 (211)

SPECIES	NO. PLOTS	BASAL AREA	AGE	SITE INDEX	GBA	PROD. INDEX
ABGR	4	119/187	129/53	80/26	260/161	88/80
LAOC	3	58/88	184/137	81/8	167/126	53/37
PIEN	2	15/70	110/153	60/38	258/210	63/76

Veg. Composition: The grand fir/Columbia brome plant association is found at mid- elevations in the southern Blue and Ochoco Mountains. Grand fir is the dominant tree species with seral Douglas-fir and larch strongly associated. Shrub coverage is minor. Columbia brome (BRVU) is the most abundant herb. Forbs which are prevalent are mitella (MIST2), sweet cicely (OSCH), white hawkweed (HIAL), bedstraw (GATR), and heartleaf arnica (ARCO).

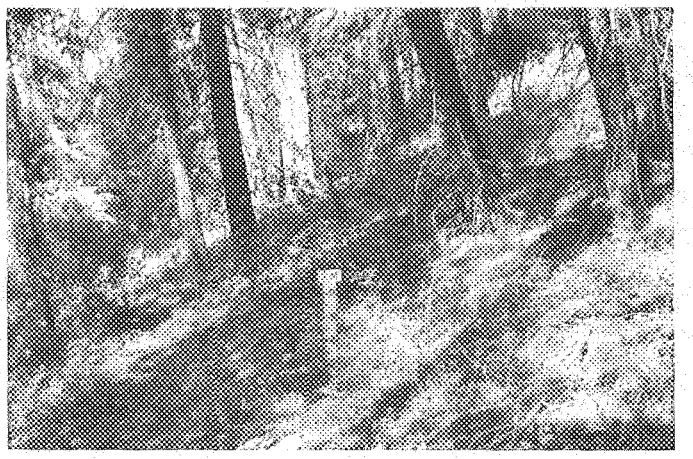
Typal Comparisons: Columbia brome has a high fidelity to the moist end of the grand fir plant associations. The ABGR/BRVU plant association represents a shrubless grand fir community where the environment is too dry for ABGR/CLUN and too moist for ABGR/CAGE and ABGR/CARU.

Successional Relationships: Western larch and Douglas-fir are seral to grand fir. Moderately cool, moist environmental conditions promote Columbia brome, swamp gooseberry, skunkleaved polemonium, starry Solomon's seal, sweet cicely, and columbine.

Management Considerations: Silvicultural options for these sites are varied dependent upon the successional status of stands and management objectives. Composition of late seral stands, where tolerant grand fir dominates, promotes insect defoliation by spruce budworm and Douglas-fir tussock moth and pathogen problems (Indian paint fungus). The tree species, PSME and LAOC are promoted by fire--ABGR and PIEN are susceptible to fires. Forage is available in late seral or climax stands; browse and cover are provided big game.

Relationship to Other Studies: The ABGR/BRVU plant association has not been previously described.

Grand fir/birchleaf spiraea plant association
Abies grandis/Spiraea betulifolia
ABGR/SPBE (CWS3 22)



Tucannon River Canyon (Pomeroy RD, Umatilla NF)

Table of Principal Species (n = 9)

Species	Code	Mean Cov (%)	Cons. (%)	Range
grand fir	ABGR	22	100	3-40
Douglas-fir	PSME	26	100	1-60
western larch	LAOC	14	44	3-40
ponderosa pine	PIPO	23	77	5-45
spiraea	SPBE	10	100	5-20
Scouler willow	SASC	2	55	1-3
big huckleberry	VAME	6	44	3-8
prince's pine	CHUM	2	55	1-7
baldhip rose	ROGY	4	44	1-5
common snowberry	SYAL	9	44	1-22
Oregon boxwood	PAMY	2	44	1-3
pinegrass	CARU	38	100	1-70
elk sedge	CAGE	7	66	1-10
northwestern sedge	CACO	5	33	1-8
heartleaf arnica	ARCO	9	77	1-20
white hawkweed	HIAL	1	77	1-3
woods strawberry	FRVE	2	33	1-3
broadpetal strawberry	FRVI	5	55	1-20

ENVIRONMENT
LOCATION: North, central
ELEVATION: 3000-6240 ft. (4935 ft.)
ASPECT: All aspects
SLOPE: 6-54% (27%)
TERRAIN FEATURES: Upper, middle, or lower 1/3 of slope, on flat or convex surfaces in steep, rough to rolling terrain.
SOIL DEPTH: 28-40 in. (36 in.)
ASH DEPTH: 17-28 in. (23 in.)
SURFACE SOIL TEXTURES: sandy loam
SUBSURFACE SOIL TEXTURES: sandy loam
COARSE FRAGMENTS: 18-45% (32%)
PARENT MATERIAL: Residuum or colluvium of igneous and metamorphic rocks with a mantle of volcanic ash or loess.

UTILIZATION RESPONSE
D - CAGE, PAMY
IP - CARU, CACO, SYAL, HIAL
IU - VAME, ARCO, FRAGA, ARNE, SPBE
INV - VIAM, LATHY

STAND AND OVERSTORY ATTRIBUTES (n = 4)
HERBAGE PRODUCTION (LBS/ACRE AIR DRY): 150-600 (311)
TOTAL BASAL AREA (SQ FT/ACRE): 108-162 (135)
TREE CANOPY COVERAGE (%): 47-123 (73)
STAND GBA (SQ FT/ACRE): 116-156 (138)

SPECIES	NO. PLOTS	BASAL AREA	AGE	SITE INDEX	GBA	PROD. INDEX
ABGR	3	19/8	63/96	118/42	188/159	99/99
PIPO	3	72/104	248/57	85/39	113/37	41/18
PSME	2	73/95	83/121	116/172	146/101	76/369

Veg. Composition: Grand fir and Douglas-fir tend to co-dominate. Birchleaf spiraea (SPBE) and common snowberry (SYAL) provide a shrub domination beneath grand fir stands. Pinegrass (CARU), elk sedge (CAGE) and heartleaf arnica (ARCO) are present; often at higher coverages than the shrubs. The ABGR/SPBE plant association has close affiniities to the Douglas-fir series vegetation as exemplified by high constancies of species more regularly associated with Douglas-fir plant associations.

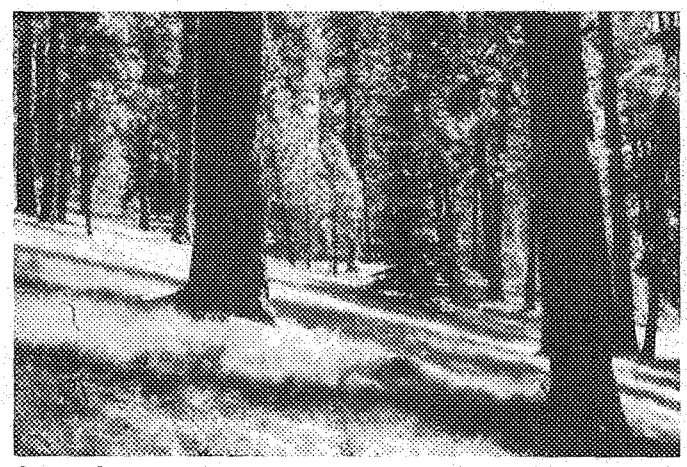
Typal Comparisons: The ABGR/SPBE association differs from ABGR/CARU in the occurrence and abundance of spiraea in the former type. The spiraea is the dominant and constant member of a diverse shrub group including snowberry, rose, huckleberry, boxwood, prince's pine, and willow. While these two associations are similar in distribution, ABGR/SPBE appears to have a deeper ash cap and greater soil water-holding capacity than ABGR/CARU. Tree productivities are similar.

Successional Relationships: Larch, Douglas-fir and ponderosa pine are all important seral tree species in this type. Oregon boxwood (PAMY), serviceberry (AMAL), and pinemat manzanita (ARNE) are important seral shrub species. Herbs which tend to increase with soil surface disturbance and ungulate use are northwestern sedge (CACO), heartleaf arnica (ARCO), strawberries, lupines, vetch (VIAM), peavines (LATHY) and long stalked clover (TRLO3).

Management Considerations: Droughty soils, warm aspects, and competition from rhizomatous understory shrubs and herbs are concerns for successful natural and artificial regeneration following harvest activities. Douglas-fir, ponderosa pine, and larch are seral trees in this association. Stand of grand fir and Douglas-fir are susceptible to the insect defoliators, spruce budworm and Douglas-fir tussock moth. Surface fires have historically favored the seral trees and the rhizomatous understory vegetation. There is seasonal use of the understory by both domestic livestock and big game; passerines, grouse, and bear find food in the associated shrubs.

Relationship to Other Studies: Steele (1981) described ABGR/SPBE in central Idaho; Cooper, et al (1987) classified ABGR/SPBE as a minor habitat type in north central Idaho; Johnson and Simon (1987) classified ABGR/SPBE in the southern Wallowa Mountains. Hall (1973) did not describe ABGR/SPBE but included this vegetation within the mixed conifer-pinegrass plant community type of the Blue Mountains.

Grand fir/pinegrass plant association
Abies grandis/Calamagrostis rubescens
ABGR/CARU (CWG1 13)



Canyon Creek RNA (Bear Valley RD, Malheur NF)

Table of Principal Species (n = 26)

Species	Code	Mean Cov (%)	Cons. (%)	Range
grand fir	ABGR	21	100	1-75
Douglas-fir	PSME	11	84	1-60
western larch	LAOC	8	46	1-37
ponderosa pine	PIPO	30	96	1-70
lodgepole pine	PICO	13	19	2-25
common snowberry	SYAL	1	42	1-3
creeping Oregon-grape	BERE	2	50	1-3
pinegrass	CARU	38	100	10-85
elk sedge	CAGE	13	92	2-40
white hawkweed	HIAL	2	57	1-9
western hawkweed	HIAL2	3	53	1-7
heartleaf arnica	ARCO	7	57	1-20
yarrow	ACMIL	2	61	1-3
tailcup lupine	LUCA	4	46	1-15
other lupines	LUPIN	4	27	1-10
woods strawberry	FRVE	2	38	1-3
broadpetal strawberry	FRVI	3	30	1-7

ENVIRONMENT
LOCATION: Central, south
ELEVATION: 4050-6500 ft. (5393 ft.)
ASPECT: Principally southerly aspects
SLOPE: 2-80% (19%)
TERRAIN FEATURES: Ridgetop, upper, middle, or lower 1/3 of slope, toeslope, or bottom on all surfaces in steep, rough, rolling or undulating terrain.
SOIL DEPTH: 24-59 in. (39 in.)
ASH DEPTH: 6-31 in. (19 in.)
SURFACE SOIL TEXTURES: loamy sand, sandy loam, silt loam
SUBSURFACE SOIL TEXTURES: loamy sand, sandy loam, silt loam, silty clay loam, clay loam, clay
COARSE FRAGMENTS: 6-85% (35%)
PARENT MATERIAL: Residuum and/or colluvium of igneous, sedimentary, or metamorphic rocks with a mantle of ash.

UTILIZATION RESPONSE
D - CAGE, CARU
IP - SYAL, HIERA
IU - ARCO, ACMIL, FRAGA, LUCA
INV - VIAM

STAND AND OVERSTORY ATTRIBUTES (n = 21)
HERBAGE PRODUCTION (LBS/ACRE AIR DRY): 125-800 (339)
TOTAL BASAL AREA (SQ FT/ACRE): 55-260 (151)
TREE CANOPY COVERAGE (%): 40-106 (65)
STAND GBA (SQ FT/ACRE): 86-213 (138)

SPECIES	NO. PLOTS	BASAL AREA	AGE	SITE INDEX	GBA	PROD. INDEX
ABGR	25	47/21	121/34	87/6	198/22	76/15
LAOC	8	26/29	159/61	93/16	132/41	52/17
PSME	18	27/14	153/35	80/7	178/24	60/10
PIPO	24	98/29	264/47	77/4	130/17	42/6
PICO	6	93/52	92/22	74/9	142/28	45/10

Veg. Composition: A nearly shrubless grand fir, Douglas-fir, and ponderosa pine dominated community with high coverage by pinegrass (CARU) and elk sedge (CAGE). The forb composition is usually limited with low coverages by a few species. Prominent forbs are the hawkweeds, lupines, strawberries and heartleaf arnica. Tailcup lupine (LUCA) has high fidelity in ABGR/CARU communities. Very common plant association in the Southern Blue and Ochoco Mountains.

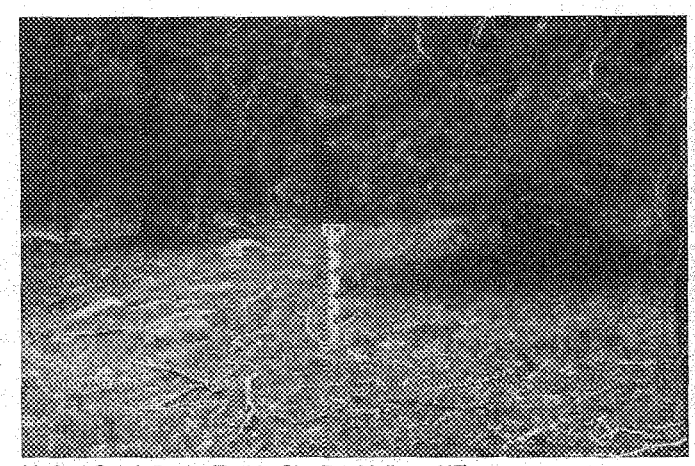
Typal Comparisons: ABGR/CARU is distinguished by a continuous sward of pinegrass (CARU). Elk sedge (CAGE) is usually subordinate to the pinegrass understory. Shrubs are virtually absent from the association due to the competition of the rhizomatous CARU and CAGE. Alternatively, elk sedge is abundant and dominant in the ABGR/CAGE plant association, while spiraea is conspicuous and dominates the shrub layer in the ABGR/SPBE plant association. Soils have low water-holding capacity and characteristics dominated by the occurrence of volcanic ash parent material.

Successional Relationships: Many stands will have a ponderosa pine overstory dominance reflecting the repetitive occurrence of underburning and subsequent elimination of grand fir. Western larch and lodgepole pine are pioneering tree species following stand replacement burns. Heartleaf arnica (ARCO), tailcup lupine (LUCA), and vetch (VIAM) increase with ungulate disturbance.

Management Considerations: Droughty soils, warm aspects, and competition from the rhizomatous pinegrass and elk sedge are consideration in the development of appropriate regeneration alternatives for mature stands of this plant association. Douglas-fir, ponderosa pine, larch, and lodgepole pine occur as seral trees. As the grand fir component increases the stand susceptibility to insect defoliators increases. Fire favors the fire-resistant PIPO, PSME, and LAOC with a CARU understory. Elk, deer, cattle, and sheep use the grass and sedge understory late in the season after more preferred forage has dried.

Relationship to Other Studies: Hall (1973) first described ABGR/CARU communities as part of the mixed conifer/ pinegrass plant community types. Steele (1981), Johnson and Simon (1987) described ABGR/CARU as limited types in central Idaho and the southern Wallowa Mountains respectively.

Grand fir/elk sedge plant association
Abies grandis/Carex geyeri
ABGR/CAGE (CWG1 11)



McCoy Creek Basin (Prairie City Rd, Malheur NF)

Table of Principal Species (n = 10)

Species	Code	Mean Cov (%)	Cons. (%)	Range
grand fir	ABGR	41	100	5-90
Douglas-fir	PSME	11	90	1-25
ponderosa pine	PIPO	18	70	1-48
western larch	LAOC	3	20	2-3
common snowberry	SYAL	3	60	1-7
prince's pine	CHUM	3	40	1-7
creeping Oregon-grape	BERE	3	30	2-5
elk sedge	CAGE	25	100	2-60
pinegrass	CARU	3	70	1-7
white hawkweed	HIAL	2	50	1-7
heartleaf arnica	ARCO	2	40	1-3
bigleaf sandwort	ARMA3	4	50	2-10
woods strawberry	FRVE	3	30	1-7
sidebells pyrola	PYSE	2	30	1-3
rattlesnake plantain	GOOB	1	30	1-1
yarrow	ACMIL	2	30	1-3
tailcup lupine	LUCA	3	30	1-7

ENVIRONMENT
LOCATION: Central, south
ELEVATION: 4650-6750 ft. (6004 ft.)
ASPECT: Principally southerly exposures
SLOPE: 1-66% (21%)
TERRAIN FEATURES: Ridgetop, upper, or middle 1/3 of slope on all surfaces in steep, rough to rolling or undulating terrain.
SOIL DEPTH: 20-51 in. (33 in.)
ASH DEPTH:
SURFACE SOIL TEXTURES: Sandy loam, loam, silt loam
SUBSURFACE SOIL TEXTURES: Sandy loam, loam, silt loam, silt
COARSE FRAGMENTS: 2-87% (44%)
PARENT MATERIAL: Residuum of igneous and metamorphic rocks.

STAND AND OVERSTORY ATTRIBUTES (n = 6)
HERBAGE PRODUCTION (LBS/ACRE AIR DRY): 50-600 (215)
TOTAL BASAL AREA (SQ FT/ACRE): 80-292 (154)
TREE CANOPY COVERAGE (%): 30-92 (66)
STAND GBA (SQ FT/ACRE): 75-380 (176)

UTILIZATION RESPONSE
D - CAGE
IP - CARU, HIAL, SYAL
IU - ARCO, FRVE, ACMIL, LUCA
INV - -

SPECIES	NO. PLOTS	BASAL AREA	AGE	SITE INDEX	GBA	PROD. INDEX
ABGR	5	92/109	123/68	75/20	233/128	90/72
PSME	3	15/18	123/172	79/18	148/145	51/46
PIPO	4	67/87	200/66	80/21	89/75	33/38

Veg. Composition: The ABGR/CAGE plant association occurs on the warm, dry end of the grand fir series. Ponderosa pine and Douglas-fir are strongly associated with grand fir. Common snowberry (SYAL) is often present in limited amounts. Elk sedge is the dominant herbaceous plant. Pinegrass is absent or limited in occurrence. Forbs appearing at low coverage are bigleaf sandwort (ARMA3), white hawkweed (HIAL), and heartleaf arnica (ARCO).

Typal Comparisons: The ABGR/CAGE community occupies drier sites than ABGR/CARU and ABGR/ARCO. Soils have the lowest water-holding capacity of the grand fir plant associations. Residual soils are prominent substrates; this reduces pinegrass abundance and favors elk sedge.

Successional Relationships: Many stands will have a ponderosa pine overstory dominance reflecting the repetitive occurrence of past underburning with resultant elimination of grand fir. In the absence of fire disturbance, grand fir has the potential to dominate these sites. With ungulate and soil surface disturbance lupines (especially LUCA), woods strawberry (FRVE), heartleaf arnica (ARCO), and yarrow (ACMIL) increase.

Management Considerations: Warm, dry sites and competition from the rhizomatous elk sedge are considerations for regeneration alternatives. Douglas-fir, ponderosa pine, and larch occur as seral trees. Stands of Douglas-fir and grand fir are susceptible to spruce budworm and tussock moth defoliation and damage. Soil compactibility and movement by water of the residual soils should be considered for grazing and silvicultural operations.

Relationship to Other Studies: The ABGR/CAGE plant association has not been previously described. It was included as part of the mixed conifer/pinegrass pct by Hall (1973).

Grand fir/heartleaf arnica plant community type
Abies grandis/Arnica cordifolia
ABGR/ARCO (no code)

The ABGR/ARCO plant community type is seral to the ABGR/CARU plant association. Environmental, soils, and tree characteristics are summarized with the ABGR/CARU description.

Veg. Composition: The seral nature of these communities is expressed by the high constancy of seral ponderosa pine and Douglas-fir with the grand fir. These are essentially shrubless communities where the pinegrass dominance of ABGR/CARU has been replaced by heartleaf arnica patches that dominate the forest understory.

Typal Comparisons: ABGR/CARU late seral communities average over 50% CARU-CAGE cover with less than 10% ARCO. ABGR/ARCO seral communities average 15% cover of CARU-CAGE stands with 25% heartleaf arnica associated. The ABLA2/ARCO pct contains VAME, more mesic forbs (i.e., false bugbane, Piper's anemone, round leaved violet), and has spruce associated as apposed to PIPO and PSME.

Successional Relationships: The ABGR/ARCO pct is a seral stage of the ABGR/CARU plant association. Ponderosa pine and Douglas-fir are seral to the grand fir. Pinegrass and elk sedge are dominated or codominated by heartleaf arnica. With overgrazing and surface disturbance lupines (especially LUCA), strawberries, arnica, and hawkweeds are the prominent increasing forb species.

Management Considerations: Treat similarly to the ABGR/CARU plant association vegetation.

UTILIZATION RESPONSE
D - CAGE
IP - CARU, HIERA, OSCH, SYAL
IU - ARCO, LUPIN, FRVE
INV - -

Relationship to Other Studies: The ABGR/ARCO pct has not been previously described.

Table of Principal Species (n = 10)

Species	Code	Mean Cov (%)	Cons. (%)	Range
grand fir	ABGR	48	100	8-82
Douglas-fir	PSME	20	100	1-43
ponderosa pine	PIPO	21	90	3-49
western larch	LAOC	1	20	1-1
creeping Oregon-grape	BERE	1	50	1-3
common snowberry	SYAL	1	30	1-1
pinegrass	CARU	4	80	1-6
elk sedge	CAGE	11	100	3-25
heartleaf arnica	ARCO	25	100	10-40
white hawkweed	HIAL	2	50	1-3
western hawkweed	HIAL2	1	40	1-2
tailcup lupine	LUCA	4	60	1-10
other lupine	LUPIN	8	40	3-12
woods strawberry	FRVE	3	70	1-8
sweet cicely	OSCH	3	50	1-4
mitella	MIST2	1	40	1-1

Lodgepole pine plant community types

The following lodgepole pine dominated plant community types are presented as seral stages of grand fir plant associations described in the Blue and Ochoco Mountains. Further sampling, part of successional studies being conducted for grand fir vegetation, will lead to a better understanding and description of this vegetation.

Lodgepole pine (grand fir)/big huckleberry - twinflower plant community type
Pinus contorta (Abies grandis)/Vaccinium membranaceum - Linnaea borealis
PICO(ABGR)/VAME-LIBO2 (n = 4) (CLS5)

This plant community type represents an early seral stage of the ABGR/LIBO2 plant association. The stand develops from replacement crown fire in ABGR/LIBO2 communities. Lodgepole pine dominates on gentle slopes with larch often present. Big huckleberry and twinflower are always present. Other shrubs usually associated are grouse huckleberry (VASC), Oregon boxwood (PAMY), prince's pine (CHUM) and pinemat manzanita (ARNE). Herbaceous vegetation usually present are elk sedge (CAGE), northwestern sedge (CACO), pinegrass (CARU), heartleaf arnica (ARCO), white hawkweed (HIAL), violets, and Piper's anemone (ANPI).

Grand fir can be promoted by eliminating periodic fire and/or emphasizing fir in cultural practices. Lodgepole pine would be favored by stocking level management to encourage rapid growth. Grand fir poles and saplings may be prone to insect defoliators due to dense stocking of the sites.

This pct was described in the Wallowa-Snake (Johnson and Simon 1987) as PICO(ABGR)/LIBO2.

Lodgepole pine (grand fir)/big huckleberry/pinegrass plant community type
Pinus contorta (Abies grandis)/Vaccinium membranaceum/Calamagrostis rubescens
PICO(ABGR)/VAME/CARU (n = 6) (CLS5)

This plant community type represents an early seral stage of the ABGR/VAME plant association where lodgepole pine dominates. Western larch is usually associated with low coverage. Big huckleberry (VAME) dominates on moderate slopes with Oregon boxwood (PAMY), pinemat manzanita (ARNE), spiraea (SPBE), and prince's pine (CHUM) usually associated. Pinegrass (CARU) dominates the herbaceous vegetation. Lupines may be abundant in some stands.

This pct was differentiated from PICO(ABGR)/VAME based on the presence of pinegrass. Both PICO (ABGR)/VAME and PICO (ABGR)/VAME/CARU are considered seral stages of ABGR/VAME climax vegetation.

The dominance by pinegrass may be helpful in the retardation of overstocked trees. Grand fir will be promoted by elimination of periodic replacement fire. Lodgepole pine is promoted by thinning to control stocking level. Defoliators and bark beetles may be encouraged with lack of stocking control measures.

This pct was not described previously.

Lodgepole pine (grand fir)/big huckleberry plant community type
Pinus contorta (Abies grandis)/Vaccinium membranaceum
PICO(ABGR)/VAME (n = 2) (CLS5)

The PICO(ABGR)/VAME pct portrays an early seral stage of the ABGR/VAME plant association where lodgepole pine dominates. Western larch is present with relatively low coverage. Big huckleberry dominates the shrub and herbaceous layers. Other shrubs associated are pinemat manzanita (ARNE), Oregon boxwood (PAMY), and prince's pine (CHUM). Other plants which may occur are grouse huckleberry (VASC), heartleaf arnica (ARCO) and northwestern sedge (CACO).

Promotion of lodgepole pine is accomplished by repetitive burning or thinning to enhance rapid growth by pine and retardation of the grand fir. Ingrowth by grand fir, competition, and subsequent growth declines may promote insect problems. This pct is differentiated from PICO(ABGR)/VAME/CARU by lack of pinegrass associated in the stand.

This plant community type was previously described by Hall (1973).

Lodgepole pine (grand fir)/pinegrass plant community type
Pinus contorta (Abies grandis)/Calamagrostis rubescens
PICO(ABGR)/CARU (n = 5) (CLG2)

The PICO(ABGR)/CARU pct portrays a lodgepole pine-dominated early seral stage of the grand fir/pinegrass plant association. Western larch is usually associated at low coverage. Pinegrass dominates over all herbaceous plants. Other frequently occurring herbs are elk sedge (CAGE), woods strawberry (FRVE), sweet cicely (OSCH), white hawkweed (HIAL), and heartleaf arnica (ARCO). Lupines may be prominent in disturbed understories.

The pinegrass, if abundant, may retard stocking, or help in stocking level control. Promotion of lodgepole pine results from repetitive burning and/or thinning to retard grand fir and promote spacing of the lodgepole pine. Insect defoliators and bark beetles may be encouraged by stagnation of the trees.

This plant community type was not previously described in the Blue and Ochoco Mountains.

Lodgepole pine (grand fir)/grouse huckleberry/pinegrass plant community type
Pinus contorta (Abies grandis)/Vaccinium scoparium/Calamagrostis rubescens
PICO(ABGR)/VASC/CARU (n = 16) (CLS4)

This plant community type represents a lodgepole pine dominated early seral stage of the ABGR/VASC plant association. Western larch is usually associated at lower coverages. Grouse huckleberry dominates the shrub layer. Oregon boxwood (PAMY) and prince's pine (CHUM) are usually present. Big huckleberry may occur but is poorly represented due to the harshness of the site. Pinegrass and/or elk sedge are the dominant herbaceous plants. Forbs which frequently occur are white hawkweed (HIAL), fireweed (EPAN), lupines, and woods strawberry (FRVE).

Lodgepole pine is promoted by repetitive fire and/or thinning by retarding grand fir and encouraging vigorous lodgepole pine. The sites are cold but do not limit grand fir establishment. Insects and diseases of lodgepole pine increase as stands stagnate or mature.

This plant community type was previously described by Hall (1973).

Lodgepole pine (grand fir)/big huckleberry/bracken plant communities
Pinus contorta (Abies grandis)/Vaccinium membranaceum/Pteridium aquilinum
PICO(ABGR)/VAME/PTAQ (n = 1) (CLS5)

This community appears to be an early seral stage of the ABGR/VAME plant association where bracken (PTAQ) is abundant beneath a dominant stand of lodgepole pine. Western larch was present. Big huckleberry dominated the shrub layer. Herbaceous vegetation associated were strawberries, violets, and heartleaf arnica.

Further investigation is necessary to learn more about the bracken dominance beneath seral stands in grand fir vegetation. Bracken is known to be allelopathic and may inhibit growth of tree and understory species and affect management options.

Lodgepole pine (grand fir)/pinemat manzanita plant communities
Pinus contorta (Abies grandis)/Arctostaphylos nevadensis
PICO(ABGR)/ARNE (n = 1)

This community appears to represent an early seral stage where lodgepole pine co-dominates with western larch over a shrubby understory comprised of big huckleberry (VAME) and pinemat manzanita (ARNE). Further investigation will be required to determine successional assignment to either the ABGR/LIBO2 or ABGR/VAME plant associations. Pinemat manzanita response to tree overstory removal and burning is under study in grand fir series vegetation.

Lodgepole pine (grand fir)/Sitka alder plant communities
Pinus contorta (Abies grandis)/Alnus sinuata
PICO(ABGR)/ALSI (n = 2) (CLS6)

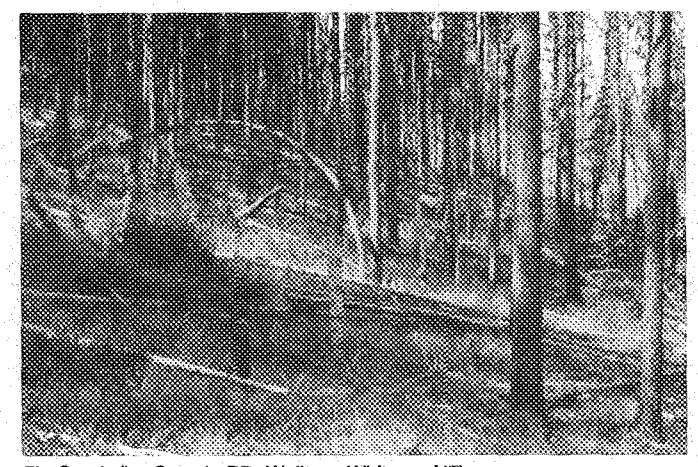
The PICO/ALSI plant communities may be a seral stage of ABGR/CLUN, ABGR/TABR/CLUN, and other grand fir plant associations pertaining to the moist end of the series. Sitka alder dominates beneath the lodgepole pine dominated overstory. Grand fir, larch, Engelmann spruce and Douglas-fir may be present. Big huckleberry (VAME), prince's pine (CHUM), Oregon boxwood (PAMY), and Scouler willow (SASC) are other shrubs often occurring in these communities. Forbs are low in abundance due to the dominance of, and competition from, Sitka alder.

More investigation is needed to assign this plant community to a plant association.

Grand fir-Alaska yellow cedar/big huckleberry plant communities
Abies grandis-Chamaecyparis nootkatensis/Vaccinium membranaceum
ABGR-CHNO/VAME (n = 1)

This relict stand of Alaska yellow-cedar occurs in the Aldrich Range of the Bear Valley Ranger District at 5600 ft. The dense tree overstory is dominated by 200 year old Alaska yellow cedar with 180 year old grand fir on a north aspect. Big huckleberry, sidebells pyrola, and prince's pine are the most prominent plants in the forest understory. The stand has been protected as a Botanic Area on the Malheur National Forest.

Lodgepole pine/pinegrass plant association
Pinus contorta/Calamagrostis rubescens
PICO/CARU (CLS4 16)



Fly Creek (La Grande RD, Wallowa-Whitman NF)

Table of Principal Species (n = 8)

Species	Code	Mean Cov (%)	Cons. (%)	Range
Lodgepole pine	PICO	61	100	33-90
grouse huckleberry	VASC	30	50	1-80
pinemat manzanita	ARNE	8	25	1-15
creeping Oregon grape	BERE	2	25	1-3
buffaloberry	SHCA	5	25	1-8
pinegrass	CARU	25	100	5-50
elk sedge	CAGE	18	62	1-50
Ross' sedge	CARO	2	37	1-3
heartleaf arnica	ARCO	3	37	1-5
tailcup lupine	LUCA	4	25	2-5
silvery lupine	LUAR3	11	37	1-24
broadpetal strawberry	FRVI	3	75	1-10
woods strawberry	FRVE	2	62	1-5
violets	VIOLA	2	87	1-5
yarrow	ACMIL	1	62	1-2
fireweed	EPAN	1	75	1-1

ENVIRONMENT
LOCATION: Central, south
ELEVATION: 4000-5675 ft. (5163 ft.)
ASPECT: All aspects
SLOPE: 2-30% (14%)
TERRAIN FEATURES: Lower 1/3 of slope, toeslope, or bottom position on all surfaces in steep, rolling to undulating, or flat terrain.
SOIL DEPTH: 30-59 in. (41 in.)
ASH DEPTH: 12-22 in. (17 in.)
SURFACE SOIL TEXTURES: sandy loam
SUBSURFACE SOIL TEXTURES: sandy loam, sandy clay
COARSE FRAGMENTS: 5-51% (30%)
PARENT MATERIAL: Residuum and colluvium of igneous rocks, most with a mantle of ash.

UTILIZATION RESPONSE
D - CAGE
IP - CARO, CARU
IU - ARCO, LUCA, FRAGA, ACMIL
INV - EPAN

STAND AND OVERSTORY ATTRIBUTES (n=8)
HERBAGE PRODUCTION (LBS/ACRE AIR DRY): 150-450 (313)
TOTAL BASAL AREA (SQ FT/ACRE): 80-162 (122)
TREE CANOPY COVERAGE (%): 33-90 (64)
STAND GBA (SQ FT/ACRE): 124-146 (133)

SPECIES	NO. PLOTS	BASAL AREA	AGE	SITE INDEX	GBA	PROD. INDEX
PICO	8	120/29	94/20	73/6	132/4	42/5

Veg. Composition: Lodgepole pine dominates. Presence by other regenerating tree species is incidental (or less than 1%). Western larch is usually absent. The dominant understory plant is pinegrass (CARU) with elk sedge (CAGE) strongly associated. Grouse huckleberry (VASC) may dominate over pinegrass on some sites. Prominent forbs are heartleaf arnica (ARCO), lupines, strawberries, and violets.

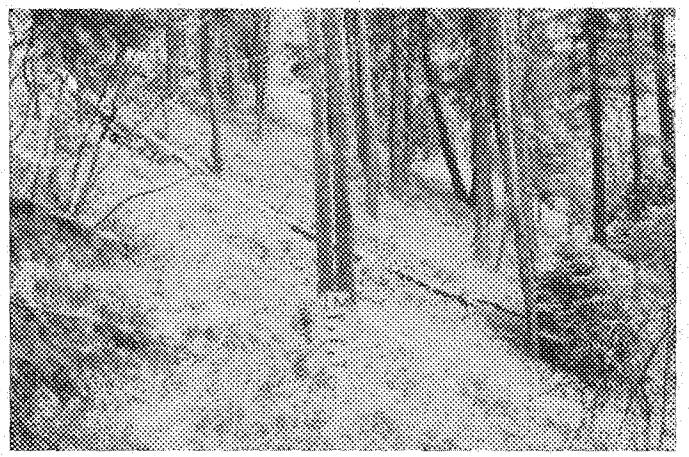
Typal Comparisons: In the PICO/CARU plant association, pinegrass dominates an essentially herbaceous understory. Lodgepole pine is dominant; true firs incidental. Unlike PICO(ABGR)/CARU communities, larch is not usually associated. An occasional subalpine fir may occur and grouse huckleberry is sometimes abundant in climax PIPO/CARU due to the cold, frost-prone environment.

Successional Relationships: The lodgepole pine/pinegrass community is considered climax on sites which have lost the potential to grow and maintain true fir resulting from the topographic orientation where cold air inhibits fir establishment and growth. Periodic stand replacement burns have provided the even-aged stand structure usually found. Species pioneering after these burns are fireweed, lupines, pinegrass, buffaloberry, and pinemat manzanita.

Management Considerations: Competition from the rhizomatous pinegrass and elk sedge, as well as droughty, cold soils, potential bark beetle outbreaks, and pocket gopher incidence are factors to consider for silvicultural operations. Fire perpetuates this community---stand replacement fires promote even-aged stands while surface fires lead to multiple-age classes. The understory provides forage for domestic stock and deer and elk.

Relationship to Other Studies: Pfister, etal (1977) described PICO/CARU as a community type in Montana; Steele (1981) described PICO/CAGE as a community type in central Idaho. Both authors felt these could be climax in certain topographic settings. Hall (1973); Johnson and Simon (1987) treated PICO/CARU communities as seral to true fir plant associations.

Douglas-fir/big huckleberry plant association
Pseudotsuga menziesii/Vaccinium membranaceum
PSME/VAME (CDS8 21)



Hibbard Gulch (Baker RD, Wallowa-Whitman NF)

Table of Principal Species (n = 5)

Species	Code	Mean Cov (%)	Cons. (%)	Range
Douglas-fir	PSME	27	100	20-40
ponderosa pine	PIPO	17	100	4-20
western larch	LAOC	5	40	3-7
big huckleberry	VAME	36	100	20-60
spiraea	SPBE	3	100	1-4
baldhip rose	ROGY	1	100	1-3
pinemat manzanita	ARNE	4	40	1-7
pinegrass	CARU	35	100	15-60
elk sedge	CAGE	4	100	3-7
northwestern sedge	CACO	2	60	1-3
white hawkweed	HIAL	2	60	1-3
tailcup lupine	LUCA	1	60	1-1
broadpetal strawberry	FRVI	2	40	1-2

ENVIRONMENT
LOCATION: Central
ELEVATION: 4050-5250 ft. (4690 ft.)
ASPECT: All aspects
SLOPE: 8-80% (30%)
TERRAIN FEATURES: Middle 1/3 of slope on all surfaces in steep, rolling terrain.
SOIL DEPTH: 35 in.
ASH DEPTH: 10 in.
SURFACE SOIL TEXTURES: sandy loam, silt
SUBSURFACE SOIL TEXTURES: sandy loam
COARSE FRAGMENTS: 37-59% (45%)
PARENT MATERIAL: Residuum and colluvium of igneous, sedimentary, and metamorphic rocks, some with a mantle o ash.

UTILIZATION RESPONSE
D - CAGE, PAMY
IP - CARU, CACO
IU - VAME, ARNE, LUCA, FRVI, SPBE
INV - PTAQ

STAND AND OVERSTORY ATTRIBUTES (n = 1)
HERBAGE PRODUCTION (LBS/ACRE AIR DRY): 275-650 (441)
TOTAL BASAL AREA (SQ FT/ACRE): (130)
TREE CANOPY COVERAGE (%): 40-60 (47)
STAND GBA (SQ FT/ACRE): 87

SPECIES	NO. PLOTS	BASAL AREA	AGE	SITE INDEX	GBA	PROD. INDEX
PSME	1	90/-	145/-	79/-	90/-	28/-
PIPO	1	20/-	145/-	78/-	80/-	25/-

Veg. Composition: This plant association portrays the Douglas-fir climax community with big huckleberry (a shrub mor commonly occurring with true fir climax communities). Big huckleberry extends onto these warmer sites with plants tha typically occupy the drier, warmer end of the grand fir series vegetation (i.e., spiraea, elk sedge, pinegrass).

Typal Comparisons: Compositionally similar to PSME/CARU with the addition of the low shrub, big huckleberr (VAME); this plant association has a distribution on cool, moist sites of the PSME series.

Successional Relationships: Western larch and ponderosa pine are seral tree species. Seral species for the type ar pinemat manzanita (ARNE), Oregon boxwood (PAMY), creeping Oregon-grape (BERE), heartleaf arnica (ARCO), brack en (PTAQ), tailcup lupine (LUCA), and strawberries.

Management Considerations: A broad range of resource values can be emphasized on sites of this plant associatio Concern for shrub competition may indicate machine scarification as a silvicultural tool on appropriate sites. Ungulat use is light, but big huckleberry provides food for grouse and bear. Fire favors ponderosa pine and larch, common ser tree species within this association.

Relationship to Other Studies: The PSME/VAGL habitat type is a major type in Montana where Pfister, et al (1977 described it. Steele (1981) found it to be an incidental type in central Idaho, as did Cooper, et al (1987) in northern Idaho It is an incidental plant association in the Wallowa-Snake (Johnson and Simon - 1987).

Douglas-fir/ninebark plant association
Pseudotsuga menziesii/Physocarpus malvaceus
PSME/PHMA (CDS7 11)

North Fork John Day Canyon (North Fork John Day RD, Umatilla NF)

Table of Principal Species (n = 19)

Species	Code	Mean Cov (%)	Cons. (%)	Range
Douglas-fir	PSME	37	100	5-80
ponderosa pine	PIPO	16	57	1-51
western larch	LAOC	8	26	1-18
ninebark	PHMA	46	100	15-90
common snowberry	SYAL	13	94	1-40
serviceberry	AMAL	3	73	1-10
baldhip rose	ROGY	5	73	1-20
spiraea	SPBE	5	73	1-20
creeping Oregon-grape	BERE	2	42	1-5
oceanspray	HODI	5	42	2-10
pinegrass	CARU	16	89	3-47
elk sedge	CAGE	11	100	1-27
woods strawberry	FRVE	2	68	1-7
heartleaf arnica	ARCO	6	63	1-8
yarrow	ACMIL	2	52	1-3
mitella	MIST2	4	36	2-7
false Solomon's seal	SMRA	2	36	1-3

ENVIRONMENT
LOCATION: North, central
ELEVATION: 2360-5800 ft. (3625 ft.)
ASPECT: Principally northerly exposures
SLOPE: 3-120% (63%)
TERRAIN FEATURES: Upper, middle, or lower 1/3 of slope on flat or convex surfaces in steep, rough to rolling terrain.
SOIL DEPTH: 18-70 in. (40 in.)
ASH DEPTH: 5-24 in. (12 in.)
SURFACE SOIL TEXTURES: sandy loam, silt
SUBSURFACE SOIL TEXTURES: sandy loam, silt, silty clay loam
COARSE FRAGMENTS: 10-65% (39%)
PARENT MATERIAL: Residuum and colluvium of igneous and sedimentary rocks, some with a mantle of ash or loess

UTILIZATION RESPONSE
D - CAGE, AMAL
IP - CARU, SYAL
IU - FRVE, ARCO, ACMIL, SPBE
INV - EPAN, LATHY, VIAM

STAND AND OVERSTORY ATTRIBUTES (n = 10)
HERBAGE PRODUCTION (LBS/ACRE AIR DRY): 150-535 (273)
TOTAL BASAL AREA (SQ FT/ACRE): 50-168 (105)
TREE CANOPY COVERAGE (%): 10-84 (48)
STAND GBA (SQ FT/ACRE): 74-204 (117)

SPECIES	NO. PLOTS	BASAL AREA	AGE	SITE INDEX	GBA	PROD. INDEX
PSME	9	64/19	109/37	88/13	124/53	50/21
PIPO	4	62/66	185/121	88/19	125/50	47/23
LAOC	3	35/98	156/214	97/39	115/115	49/75

Veg. Composition: A steep canyon slope forested community dominated by Douglas-fir with ponderosa pine usuall associated; larch is infrequent. Ninebark (PHMA), common snowberry (SYAL), spiraea (SPBE), serviceberry (AMAL and baldhip rose(ROGY) are the principal shrubs. Principal herbs are pinegrass (CARU), elk sedge (CAGE), wood strawberry (FRVE), and heartleaf arnica (ARCO). Aspect strongly controls the distribution of these communities.

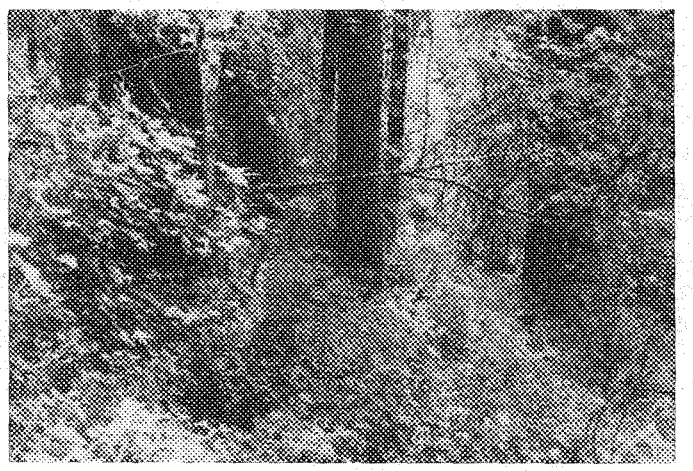
Typal Comparisons: Physiognomy and composition are similar to PSME/HODI stands but the tall shrub component i dominated by ninebark, not oceanspray. Tree productivities are moderate in this association with PIPO, PSME, an LAOC all showing similar potential.

Successional Relationships: Stand replacing fire has been the principal modifying event. Stands are replaced wit shrubfields dominated by ninebark, oceanspray, Scouler willow, Rocky Mountain maple, cherry, and serviceberry. Th pinegrass-elk sedge stand may also be promoted by tree-replacement burns. Forbs exhibiting an increase with fire i PSME/PHMA are fireweed (EPAN), peavines (LATHY), vetch (VIAM), heartleaf arnica (ARCO), and asters.

Management Considerations: Steep slopes and shrub and grass competition create concerns for timber managemen Silvicultural operations that consider stocking requirements, operability constraints, and animal-related problems ar applicable in this type. Plant species are fire-resistant and post-fire recovery occurs relatively quickly in most situation Fire will promote shrubfields with a grass-sedge mosaic. These plants are rhizomatous and competition is intense. Ver difficult to regenerate trees in less than 10 years. These early successional communities provide valuable browse fo deer and elk. Older stands provide hiding or thermal cover. A relatively droughty forest; mistletoes and root rots ar common.

Relationship to Other Studies: Described in eastern Washington by Daubenmire (1968); by Hall (1973) in the norther Blue Mountains; by Pfister, et al (1977) in Montana; by Steele (1981) in central Idaho; by Cooper, et al (1987) in norther Idaho; by Williams and Lilybridge (1983) and by Clausnitzer and Zamora (1987) in northern Washington; and b Johnson and Simon (1987) in the Wallowa Mountains.

Douglas-fir/oceanspray plant association
Pseudotsuga menziesii/Holodiscus discolor
PSME/HODI **(CDS6 11)**



Mill Creek (Walla Walla RD, Umatilla NF)

Table of Principal Species (n = 8)

Species	Code	Mean Cov (%)	Cons. (%)	Range
Douglas-fir	PSME	30	100	3-55
ponderosa pine	PIPO	23	100	3-60
oceanspray	HODI	28	100	10-50
Rocky Mtn. maple	ACGL	4	62	1-8
ninebark	PHMA	4	50	1-7
serviceberry	AMAL	4	75	1-10
roses	ROSA	2	75	1-3
common snowberry	SYAL	29	100	5-60
spiraea	SPBE	7	75	1-15
creeping Oregon-grape	BERE	2	37	1-5
pinegrass	CARU	9	62	3-20
elk sedge	CAGE	7	50	1-15
western fescue	FEOC	2	62	1-3
Columbia brome	BRVU	2	75	1-3
blue wildrye	ELGL	1	37	1-2
heartleaf arnica	ARCO	6	50	3-15
woods strawberry	FRVE	2	62	1-3
white hawkweed	HIAL	2	50	1-3
Piper's anemone	ANPI	3	75	1-8
bracken	PTAQ	3	62	1-8
bigleaf sandwort	ARMA3	2	50	1-5
sweet cicely	OSCH	1	50	1-2

ENVIRONMENT
LOCATION: North
ELEVATION: 2135-3460 ft. (2582 ft.)
ASPECT: Principally southerly exposures
SLOPE: 4-55% (26%)
TERRAIN FEATURES: Lower 1/3 of slope, toeslope, or bottom position on flat or convex surfaces in steep, rough to rolling terrain.
SOIL DEPTH: 40-60 in. (50 in.)
ASH DEPTH: 16 in.
SURFACE SOIL TEXTURES: silt
SUBSURFACE SOIL TEXTURES: silt, silty clay loam
COARSE FRAGMENTS: 45-68% (57%)
PARENT MATERIAL: Residuum and colluvium of igneous or sedimentary rocks, some with a mantle of ash.

UTILIZATION RESPONSE
D - AMAL, CAGE, BRVU
IP- CARU, HIAL, ELGL, TRLO, SYAL
IU - FEOC, ARCO, FRVE, SPBE
INV - PTAQ

STAND AND OVERSTORY ATTRIBUTES (n = 5)
HERBAGE PRODUCTION (LBS/ACRE AIR DRY): 200-400 (258)
TOTAL BASAL AREA (SQ FT/ACRE): 115-256 (162)
TREE CANOPY COVERAGE (%): 35-70 (57)
STAND GBA (SQ FT/ACRE): 153-208 (184)

SPECIES	NO. PLOTS	BASAL AREA	AGE	SITE INDEX	GBA	PROD. INDEX
PSME	5	48/44	74/9	117/21	190/62	96/32
PIPO	5	110/55	104/74	107/24	181/47	84/35

Veg. Composition: A common community on lower canyon slopes and bottoms in the northern Blue Mtns. Douglas-fir and ponderosa pine co-dominate over a shrub-grass mosaic in the understory. Oceanspray (HODI), serviceberry (SYAL), spiraea (SPBE), and common snowberry (SYAL) are the principal shrubs. Pinegrass (CARU), elk sedge (CAGE), Columbia brome (BRVU), woods strawberry (FRVE), and western fescue (FEOC) are the more common herbs.

Typal Comparisons: This plant association is found on moderately warm sites; elevations range lowest of the series and exposures are principally southerly. HODI dominates the tall shrub component; PHMA, if present, has less than 5% coverage. Basal areas, tree productivities, and stockability are the highest of the PSME series for Douglas-fir and ponderosa pine.

Successional Relationships: Ponderosa pine is seral to Douglas-fir. Ungulate disturbance to these communities may provide increased dominance by pinegrass, elk sedge, Oregon-grape (BERE), blue wildrye (ELGL), heartleaf arnica (ARCO), bracken (PTAQ) and long stalked clover (TRLO).

Management Considerations: Silviculturally, a wide range of even-aged and uneven-aged systems are appropriate. Other resource values of individual stands are considerations to limit application. Winter habitat for deer and elk, summer forage for ungulates, aesthetics, and recreation are a few associated with sites supporting this plant association. Plant species are fire-resistant; many resprout readily or, for tree species, are protected by thick bark. Competition from shrubs and grasses should be considered during regeneration activities.

Relationship to Other Studies: First described by Hall (1973) in the northern Blue Mountains; described by Clausnitzer and Zamora (1987) on the Colville Indian Reservation in northern Washington; and described in the Review Draft for the Yakima Indian Reservation of west central Washington by John and Tart (1986).

Douglas-fir/common snowberry plant association
Pseudotsuga menziesii/Symphoricarpos albus
PSME/SYAL (CDS6 24)

Fox Creek Canyon (Long Creek RD, Malheur NF)

Table of Principal Species (n = 29)

Species	*Code*	*Mean Cov (%)*	*Cons. (%)*	*Range*
Douglas-fir	PSME	30	100	5-82
ponderosa pine	PIPO	22	96	1-70
western larch	LAOC	8	13	2-20
western juniper	JUOC	2	24	1-5
common snowberry	SYAL	28	100	5-80
baldhip rose	ROGY	2	65	1-5
serviceberry	AMAL	2	51	1-10
spiraea	SPBE	7	62	1-10
creeping Oregon-grape	BERE	3	72	1-10
squaw currant	RICE	2	31	1-5
pinegrass	CARU	13	55	1-40
elk sedge	CAGE	21	79	2-60
blue wildrye	ELGL	6	41	1-25
western fescue	FEOC	3	24	1-7
western needlegrass	STOC	3	27	1-8
heartleaf arnica	ARCO	5	62	1-20
woods strawberry	FRVE	3	55	1-10
broadpetal strawberry	FRVI	3	55	1-20
yarrow	ACMIL	2	79	1-15
western hawkweed	HIAL2	1	34	1-3
tailcup lupine	LUCA	5	34	1-15
meadowrue	THOC	3	27	1-15
vetch	VIAM	6	24	1-15
showy aster	ASCO	5	20	1-10

ENVIRONMENT
LOCATION: North, central, south
ELEVATION: 2400-5575 ft. (4008 ft.)
ASPECT: All aspects
SLOPE: 3-70% (30%)
TERRAIN FEATURES: Upper, middle, or lower 1/3 of slope, toeslope, or bottom position on all surfaces in steep, rough to rolling or undulating terrain.
SOIL DEPTH: 16-66 in. (34 in.)
ASH DEPTH: 10-24 in (17 in.)
SURFACE SOIL TEXTURES: sandy loam, silt loam, silt
SUBSURFACE SOIL TEXTURES: sandy loam, silt loam, silt, silty clay loam, clay loam
COARSE FRAGMENTS: 3-66% (38%)
PARENT MATERIAL: Residuum and colluvium of igneous and sedimentary rocks, some with a mantle of ash or loess.

UTILIZATION RESPONSE
D - CAGE, AMAL
IP - CARU, ELGL, POPR, SYAL
IU - ARCO, GRAGA, ACMIL, LUCA, SPBE
INV - LATHY, VIAM

STAND AND OVERSTORY ATTRIBUTES (n = 26)
HERBAGE PRODUCTION (LBS/ACRE AIR DRY): 125-1000 (412)
TOTAL BASAL AREA (SQ FT/ACRE): 52-214 (105)
TREE CANOPY COVERAGE (%): 19-92 (53)
STAND GBA (SQ FT/ACRE): 48-254 (124)

SPECIES	NO. PLOTS	BASAL AREA	AGE	SITE INDEX	GBA	PROD. INDEX
PSME	23	53/16	118/25	89/5	138/22	56/10
PIPO	22	49/17	162/28	83/6	119/23	43/11
LAOC	4	17/22	173/160	98/48	93/59	42/41

Veg. Composition: Douglas-fir and ponderosa pine are common on these sites; ponderosa pine may dominate (but Douglas-fir demonstrates potential to succeed). Common snowberry (SYAL) and spiraea (SPBE) form a shrub layer; elk sedge (CAGE) and pinegrass (CARU) dominate the herbaceous vegetation. Baldhip rose (ROGY), creeping Oregon-grape (BERE) and serviceberry (AMAL) are prominent shrubs at low coverage.

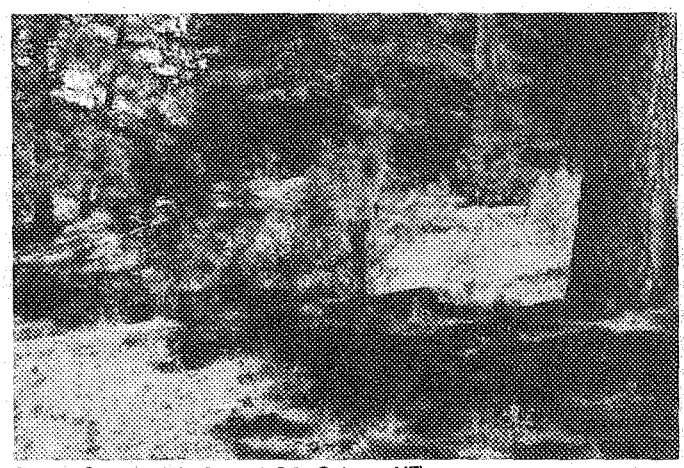
Typal Comparisons: This plant association is characterized by the occurrence and abundance of a rhizomatous low shrub layer dominated by common snowberry on warm, mesic sites. Tree productivities, basal area, and stockability are similar to the PSME/PHMA plant association.

Successional Relationships: Ponderosa pine generally precedes Douglas-fir as the principal seral tree species. Forbs abundant in early seral stages are asters, peavines, heartleaf arnica (ARCO), tailcup lupine (LUCA), vetch (VIAM), strawberries, and meadowrue (THOC). Smooth brome (BRIN), mountain brome (BRCA), and Kentucky bluegrass (POPR) often increase with disturbance.

Management Considerations: As in the Douglas-fir/tall shrub associations, competition from rhizomatous understory vegetation (SYAL, SPBE, CARU, CAGE) and animal use are factors to consider in choosing appropriate timber management systems. Plant species are fire-resistant; recurrent fire promotes ponderosa pine and pinegrass on this type. Animal use is high—deer, elk, cattle, grouse, and passerines all utilize this habitat seasonally.

Relationship to Other Studies: Described by Daubenmire (1968) in eastern Washington; by Pfister, et al (1977) in Montana; by Steele (1981) in central Idaho; by Cooper, et al (1987) in northern Idaho; Williams and Lilybridge (1983) in north central Washington; Williams, et al (1991), and Clausnitzer and Zamora (1987) in northeast Washington. Johnson and Simon (1987) described PSME/SYAL in the Wallowas of northeast Oregon.

Douglas-fir/mountain snowberry plant association
Pseudotsuga menziesii/Symphoricarpos oreophilus
PSME/SYOR (CDS6 25)



Rough Canyon (Big Summit RD, Ochoco NF)

Table of Principal Species (n = 4)

Species	Code	Mean Cov (%)	Cons. (%)	Range
Douglas-fir	PSME	23	100	20-25
ponderosa pine	PIPO	18	75	15-20
western juniper	JUOC	2	50	1-3
mountain snowberry	SYOR	20	100	8-30
creeping Oregon-grape	BERE	5	75	1-8
squaw currant	RICE	3	75	2-5
cherries	PRVI, PREM	12	75	1-35
serviceberry	AMAL	1	75	1-1
Oregon boxwood	PAMY	1	50	1-1
elk sedge	CAGE	26	75	7-50
pinegrass	CARU	17	75	15-20
bottlebrush squirreltail	SIHY	11	50	1-20
heartleaf arnica	ARCO	8	75	5-10
yarrow	ACMIL	1	50	1-1
woods strawberry	FRVE	6	75	3-10
broadpetal strawberry	FRVI	4	75	2-5
western hawkweed	HIAL2	2	50	2-2
tailcup lupine	LUCA	10	50	10-10
Solomon's seal	SMILA	2	50	1-3

ENVIRONMENT
LOCATION: North, central, south
ELEVATION: 3800-5480 ft. (4885 ft.)
ASPECT: Principally southerly exposures
SLOPE: 10-52% (33%)
TERRAIN FEATURES: Ridgetop, upper, or middle 1/3 of slope on all surfaces in steep, rough to rolling or undulating terrain.
PARENT MATERIAL: Residuum and colluvium of igneous or metamorphic rocks.

UTILIZATION RESPONSE
D - CAGE
IP - CARU, SYMPH, ELGL
IU - ARCO, ACMIL, FRAGA, PENST, LUCA
INV - LATHY

STAND AND OVERSTORY ATTRIBUTES (n = 3)
HERBAGE PRODUCTION (LBS/ACRE AIR DRY):
TOTAL BASAL AREA (SQ FT/ACRE):
TREE CANOPY COVERAGE (%): 25-44 (38)
STAND GBA (SQ FT/ACRE):

Veg. Composition: Douglas-fir, ponderosa pine, and western juniper combine with a rich variety of shrubs to enhance the landscape and species diversity of the forested area. Mountain snowberry, cherries, and squaw currant are principal shrubs. Elk sedge and pinegrass are the predominant herbaceous plants.

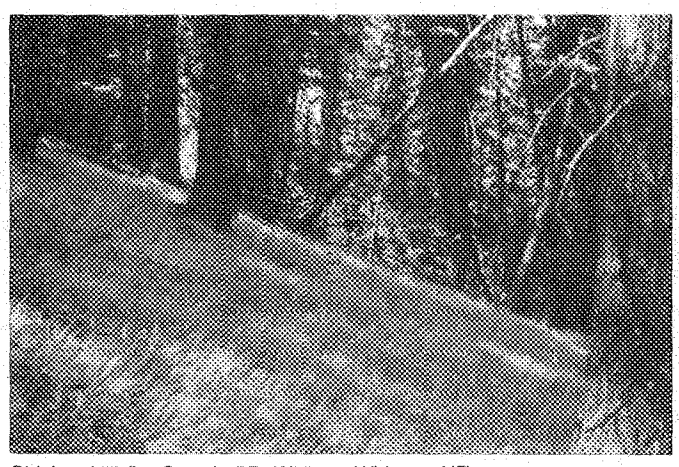
Typal Comparisons: The dominant shrub on sites supporting this plant association is non-rhizomatous mountain snowberry. Common snowberry was not found. Dry ridgetops and slopes at the upper elevational range for the PSME series are sites identified for this type.

Successional Relationships: Co-dominance by pine and Douglas-fir is common in these communities. Herbaceous plants increasing with ungulate distrubance in PSME/SYOR are peavines (LATHY), penstemons (PENST), tailcup lupine (LUCA), strawberries, blue wildrye (ELGL), and heartleaf arnica (ARCO).

Management Considerations: Shrub competition may limit the range of regeneration activities on harsh sites. Ungulates use sites for shading and browsing; mountain snowberry provides additional browse in shrub-poor areas of the southern Blue Mountains.

Relationship to Other Studies: Pfister, et al (1977) described PSME/SYOR in Montana; Steele (1981) found it in east-central Idaho and in Wyoming (1983); Williams and Lilybridge (1983) described PSME/SYOR in north-central Washington; Johnson and Simon (1987) described PSME/SYOR in the Wallowa Mountains of northeast Oregon.

Douglas-fir/pinegrass plant association
Pseudotsuga menziesii/Calamagrostis rubescens
PSME/CARU (CDG1 12)



Chicken Hill (La Grande RD, Wallowa-Whitman NF)

Table of Principal Species (n = 24)

Species	Code	Mean Cov (%)	Cons. (%)	Range
Douglas-fir	PSME	27	100	6-70
ponderosa pine	PIPO	34	95	1-53
grand fir	ABGR	2	37	1-4
common snowberry	SYAL	2	70	1-6
creeping Oregon-grape	BERE	2	66	1-6
baldhip rose	ROGY	2	41	1-6
spiraea	SPBE	2	33	1-5
pinegrass	CARU	42	100	8-90
elk sedge	CAGE	14	95	1-35
northwestern sedge	CACO	4	33	1-15
western fescue	FEOC	1	29	1-3
heartleaf arnica	ARCO	7	75	1-20
yarrow	ACMIL	2	66	1-5
broadpetal strawberry	FRVI	2	41	1-3
tailcup lupine	LUCA	4	58	1-10
white hawkweed	HIAL	2	45	1-3
western hawkweed	HIAL2	2	62	1-5

ENVIRONMENT
LOCATION: North, central, south
ELEVATION: 4050-5900 ft. (4908 ft.)
ASPECT: All aspects
SLOPE: 3-80% (20%)
TERRAIN FEATURES: Ridgetop, upper, middle, or lower 1/3 of slope on flat or convex surfaces in steep, rough to rolling or undulating terrain.
SOIL DEPTH: 16-70 in. (38 in.)
ASH DEPTH: 8-42 in. (23 in.)
SURFACE SOIL TEXTURES: sandy loam, silt
SUBSURFACE SOIL TEXTURES: clay loam
COARSE FRAGMENTS: 8-72% (35%)
PARENT MATERIAL: Residuum and colluvium of igneous, sedimentary, or metamorphic rocks, most with a mantle of ash or loess.

UTILIZATION RESPONSE
D - CAGE
IP - CARU, CACO, HIERA, SYAL
IU - FEOC, ARCO, ACMIL, FRVI, LUCA
INV - LATHY, VIAM

STAND AND OVERSTORY ATTRIBUTES (n = 18)
HERBAGE PRODUCTION (LBS/ACRE AIR DRY): 228-645 (382)
TOTAL BASAL AREA (SQ FT/ACRE): 70-213 (117)
TREE CANOPY COVERAGE (%): 46-86 (61)
STAND GBA (SQ FT/ACRE): 79-182 (115)

SPECIES	NO. PLOTS	BASAL AREA	AGE	SITE INDEX	GBA	PROD. INDEX
PSME	17	37/14	134/39	81/6	133/16	46/8
PIPO	18	77/18	243/33	75/4	106/14	33/5

Veg. Composition: Ponderosa pine commonly dominates in PSME/CARU stands from its greater fire resistance. Douglas-fir is the climax dominant, however. Common snowberry (SYAL) and creeping Oregon-grape (BERE) are common but in low coverage within the pinegrass-elk sedge dominated ground cover. Heartleaf arnica (ARCO) is the most prevalent forb.

Typal Comparisons: Understory dominance by the rhizomatous grass and sedge, CARU and CAGE, typify stands representing this plant association. Low shrubs, while ubiquitous, are somewhat inconspicuous in the pinegrass dominated understory. Sites supporting this type represent some of the highest elevation occurrences of the PSME series in the Blue Mountains. Most sampled stands had soils with a mantle of volcanic ash. Overstory productivity is moderate.

Successional Relationships: Ponderosa pine is the principal seral tree species. Spiraea (SPBE) and Oregon-grape (BERE) may be more abundant in early seral stands. Pinemat manzanita (ARNE) and ceanothus (CEVE) are pioneers following fire along with pinegrass-elk sedge. Peavines (LATHY), vetch (VIAM), tailcup lupine (LUCA) and heartleaf arnica (ARCO) are forbs that increase with distrubance in the type.

Management Considerations: Regeneration activities that consider competition from rhizomatous grasses and sedges, potential pocket gopher populations, wildlife and cattle damage of seedlings, and soil drought are appropriate in the PSME/CARU plant association. Big game and cattle may make heavy seasonal use of understory grasses, sedges and associated forbs. The association recovers quickly from fire; ponderosa pine, pinegrass, and seral shrubs (CEVE and SASC) are promoted by recurrent fire. Buckbrush serves as passerine habitat as well as a nitrogen-fixer for the site.

Relationship to Other Studies: Daubenmire (1968) described the PSME/CARU habitat type in eastern Washington; Hall (1973) incorporated PSME/CARU in the mixed conifer-pinegrass p.c.t. in the Blue Mountains; Pfister, et al (1977) described PSME/CARU in Montana; Steele (1981) considered PSME/CARU a major habitat type in central Idaho; Cooper, et al (1987) found it to be incidental in northern Idaho; Williams and Lilybridge (1983) and Williams, et al (1991), described it in northern Washington. Clausnitzer and Zamora described PSME/CARU on the Colville Indian Reservation. Johnson and Simon (1987) described it in the Wallowas.

Douglas-fir/elk sedge plant association
Pseudotsuga menziesii/Carex geyeri
PSME/CAGE (CDG1 11)

Dry Fivemile Creek (North Fork John Day RD, Umatilla NF)

Table of Principal Species (n = 7)

Species	Code	Mean Cov (%)	Cons. (%)	Range
Douglas-fir	PSME	36	100	10-80
ponderosa pine	PIPO	30	100	15-41
grand fir	ABGR	3	28	1-4
common snowberry	SYAL	2	42	1-2
baldhip rose	ROGY	1	42	1-1
creeping Oregon-grape	BERE	2	71	1-7
squaw currant	RICE	4	28	2-5
spiraea	SPBE	2	42	1-3
elk sedge	CAGE	34	100	10-80
pinegrass	CARU	2	42	1-3
western fescue	FEOC	3	28	2-3
Wheeler's bluegrass	PONE	4	71	1-7
heartleaf arnica	ARCO	5	57	1-10
broadpetal strawberry	FRVI	3	57	1-5
tailcup lupine	LUCA	3	42	1-5
yarrow	ACMIL	2	57	1-4
penstemon	PENST	1	42	1-1

ENVIRONMENT
LOCATION: Central, south
ELEVATION: 4575-5990 ft. (4942 ft.)
ASPECT: All aspects
SLOPE: 2-55% (13%)
TERRAIN FEATURES: Ridgetop, upper, or middle 1/3 of slope on flat or convex surfaces in steep, rough to rolling or undulating terrain.
SOIL DEPTH: 20-34 in. (29 in.)
ASH DEPTH:
SURFACE SOIL TEXTURES: sandy loam, silt loam
SUBSURFACE SOIL TEXTURES: sandy loam, silt loam
COARSE FRAGMENTS: 15-40% (27%)
PARENT MATERIAL: Residuum and colluvium of igneous and sedimentary rocks with mixed loess.

UTILIZATION RESPONSE
D - CAGE
IP - CARU, PONE, SYAL, CACO
IU - FEOC, ARCO, FRVI, LUCA, ACMIL
INV - -

STAND AND OVERSTORY ATTRIBUTES (n = 6)
HERBAGE PRODUCTION (LBS/ACRE AIR DRY): 125-450 (303)
TOTAL BASAL AREA (SQ FT/ACRE): 70-140 (104)
TREE CANOPY COVERAGE (%): 40-100 (67)
STAND GBA (SQ FT/ACRE): 71-131 (96)

SPECIES	NO. PLOTS	BASAL AREA	AGE	SITE INDEX	GBA	PROD. INDEX
PSME	4	33/12	79/35	71/10	123/52	36/23
PIPO	6	67/31	215/63	68/6	83/17	23/5

Veg. Composition: The PSME/CAGE plant association denotes a drier environment where elk sedge dominates and persists competively over pinegrass. Shrub coverage is low. Elk sedge is the dominant herbaceous plant. Heartleaf arnica (ARCO), broadpetal strawberry (FRVI), and Wheeler's bluegrass (PONE) are other plants usually occurring in PSME/CAGE communities. Wheeler's bluegrass demonstrates a higher fidelity to PSME/CAGE than to PSME/CARU.

Typal Comparisons: Although similar in appearance to the PSME/CARU plant association, this association is dominated by elk sedge in the understory rather than pinegrass. Pinegrass, with its greater affinity to ash, is less competitive than elk sedge on the drier, ash-free residuum. Shrub cover is inconspicuous. Overstory productivity is similar to the PSME/CARU type.

Successional Relationships: Ponderosa pine is seral to Douglas-fir. Pinemat manzanita (ARNE) and ceanothus (CEVE) are pioneers following fire and often persist well into mid seral stages. Heartleaf arnica (ARCO), strawberries, tailcup lupine (LUCA), and northwestern sedge (CACO) often increase following ground surface disturbance.

Management Considerations: Moisture competition from the rhizomatous elk sedge (CAGE) is a concern for regeneration establishment. Sites supporting this type have residual soils with about 1/2 the water holding capacity of soils supporting the PSME/CARU type. Soil drought should be considered in silvicultural operations. Fire impacts community composition by promoting seral herb, shrub, and tree establishment. Elk sedge is fire-resistant, however. Ungulate use occurs early in the grazing season.

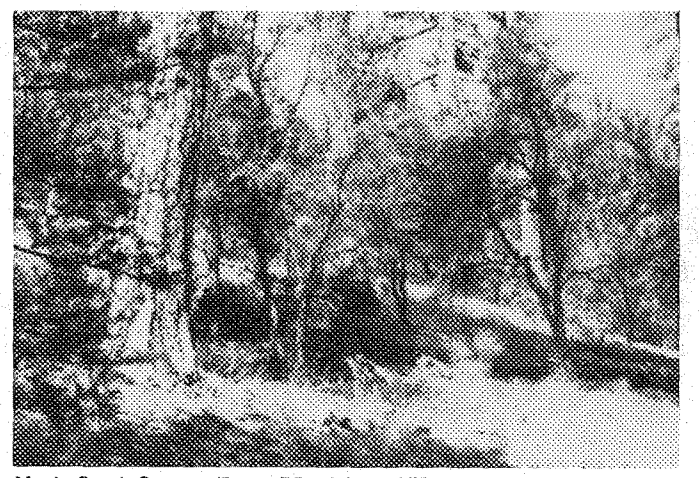
Relationship to Other Studies: Pfister, et al (1977) first described the PSME/CAGE h.t. in Montana as drier with a wider amplitude than the PSME/CARU h.t. Steele (1981) found PSME/CAGE to occupy drier aspects than PSME/CARU in Central Idaho. Hall (1973) described a similar "ponderosa pine - Douglas-fir/elk sedge" plant community type. Johnson and Simon (1987) considered pinegrass and elk sedge to be ecological equivalents in the Wallowas.

Douglas-fir/mountain mahogany/elk sedge plant community type
Pseudotsuga menziesii/Cercocarpus ledifolius/Carex geyeri
PSME/CELE/CAGE (n = 3) (CDSD)

These communities occupy dry, warm aspects where sufficient moisture permits the establishment and maintenance of Douglas-fir with ponderosa pine and juniper. Mountain-mahogany dominates the shrub layer. Common snowberry (SYAL), spiraea (SPBE), elk sedge (CAGE), and pinegrass (CARU) are normally associated. Penstemons and lupines increase with disturbance to the undergrowth.

The first description of PSME/CELE habitat types was by Steele (1981 and 1983) in east-central Idaho to western Wyoming as high elevation communities adjacent to limber pine. The p.c.t. has not been described previously in northeastern Oregon.

Ponderosa pine/mountain-mahogany/elk sedge plant association
Pinus ponderosa/Cercocarpus ledifolius/Carex geyeri
PIPO/CELE/CAGE (CPS2 32)



Myrtle Creek Canyon (Burns RD, Malheur NF)

Table of Principal Species (n = 8)

Species	Code	Mean Cov (%)	Cons. (%)	Range
ponderosa pine	PIPO	37	100	20-71
western juniper	JUOC	2	87	1-5
Douglas-fir	PSME	2	37	1-3
mountain-mahogany	CELE	18	100	7-32
creeping Oregon-grape	BERE	2	87	1-3
bitterbrush	PUTR	3	50	1-5
common snowberry	SYAL	5	37	1-7
squaw current	RICE	1	37	1-2
elk sedge	CAGE	32	100	5-60
Wheeler's bluegrass	PONE	2	62	1-7
bottlebrush squirreltail	SIHY	1	37	1-2
western needlegrass	STOC	2	37	1-2
yarrow	ACMIL	2	62	1-3
western hawkweed	HIAL2	2	37	1-3
narrowleaf pussytoes	ANST	2	50	1-4
heartleaf arnica	ARCO	2	37	2-2

ENVIRONMENT
LOCATION: Central, south
ELEVATION: 4400-5800 ft. (5318 ft.)
ASPECT: Principally southerly exposures
SLOPE: 4-65% (27%)
TERRAIN FEATURES: Ridgetop, upper or middle 1/3 of slope on all surfaces in steep, rough to rolling or undulating terrain.
SOIL DEPTH: 12-40 in. (24 in.)
ASH DEPTH:
SURFACE SOIL TEXTURES: sandy loam, loam
SUBSURFACE SOIL TEXTURES: sandy loam, loam, silt loam, clay loam
COARSE FRAGMENTS: 20-62% (51%)
PARENT MATERIAL: Residuum and colluvium of igneous, sedimentary, or metamorphic rocks with loess.

UTILIZATION RESPONSE
D - CELE, CAGE, PUTR
IP - HIAL2, SIHY, STOC
IU - PONE, ACMIL, ARCO
INV - -

STAND AND OVERSTORY ATTRIBUTES (n = 7)
HERBAGE PRODUCTION (LBS/ACRE AIR DRY): 75-400 (297)
TOTAL BASAL AREA (SQ FT/ACRE): 70-180 (108)
TREE CANOPY COVERAGE (%): 24-73 (40)
STAND GBA (SQ FT/ACRE): 41-133 (84)

SPECIES	NO. PLOTS	BASAL AREA	AGE	SITE INDEX	GBA	PROD. INDEX
PIPO	7	103/40	200/77	65/6	84/28	23/7

Veg. Composition: Ponderosa pine and western juniper generally form an open forest above the mountain-mahogan stand. Douglas-fir may occur in limited amount. Creeping Oregon-grape (BERE) is commonly found. Elk sedge is th dominant herbaceous plant. This type is the most mesic of the PIPO/CELE plant associations.

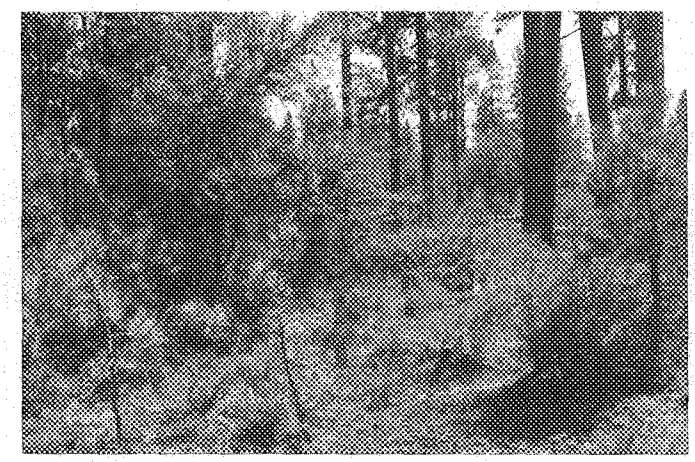
Typal Comparisons: Similar to PSME/CELE/CAGE of a cooler environment. PIPO/CELE/CAGE occurs in the centr and southern Blue and Ochoco Mountains at moderate elevations on gentle ridgetops to steep slopes. Soils are shallo to deep over varied substrates. Moderate productivities for PIPO are characteristic of this type, similar to PIPO/CAGE PIPO/PUTR/CAGE, and PIPO/PUTR/CARO.

Successional Relationships: Fire may damage mountain-mahogany and bitterbrush. Pinegrass may be promote when it is present and fire occurs. Overgrazing may promote bottlebrush squirreltail (SIHY), western needlegras (STOC), yarrow (ACMIL) and heartleaf arnica (ARCO).

Management Considerations: Sites support a highly valued community for winter use by big game---especially dee Ungulate use may severely limit the recruitment of CELE. Prescribed burning may significantly alter these communitie Elk sedge is favored with surface burns. Uneven-aged character of the community can be sustained with selectiv harvest and all aged management.

Relationship to Other Studies: This plant association has not been previously described.

Ponderosa pine/mountain-mahogany/Wheeler's bluegrass plant association
Pinus ponderosa/Cercocarpus ledifolius/Poa nervosa
PIPO/CELE/PONE (CPS2 33)



Emigrant Butte (Snow Mountain RD, Ochoco NF)

Table of Principal Species (n = 7)

Species	Code	Mean Cov (%)	Cons. (%)	Range
ponderosa pine	PIPO	36	100	23-50
western juniper	JUOC	13	71	1-25
mountain-mahogany	CELE	17	100	10-30
bitterbrush	PUTR	9	100	1-25
Ross' sedge	CARO	6	100	1-15
Wheeler's bluegrass	PONE	12	100	8-15
Idaho fescue	FEID	2	57	1-2
bottlebrush squirreltail	SIHY	2	71	1-5
western needlegrass	STOC	1	71	1-1
western groundsel	SEIN	3	100	1-5
western hawkweed	HIAL2	1	42	1-2

ENVIRONMENT
LOCATION: South
ELEVATION: 5125-5425 ft. (5304 ft.)
ASPECT: All aspects
SLOPE: 2-15% (5%)
TERRAIN FEATURES: Ridgetop or upper 1/3 of slope on flat or convex surfaces in steep, rolling to undulating terrain.
SOIL DEPTH: 10-28 in. (20 in.)
ASH DEPTH:
SURFACE SOIL TEXTURES: sandy loam, loam
SUBSURFACE SOIL TEXTURES: sandy loam, silt loam
COARSE FRAGMENTS: 25-60% (43%)
PARENT MATERIAL: Residuum and colluvium of rhyolitic rocks.

UTILIZATION RESPONSE
D - CELE, PUTR, FEID
IP - CARO, HIAL2, SIHY, STOC
IU - PONE, SEIN
INV - -

STAND AND OVERSTORY ATTRIBUTES (n = 7)
HERBAGE PRODUCTION (LBS/ACRE AIR DRY): 60-200 (129)
TOTAL BASAL AREA (SQ FT/ACRE): 55-90 (71)
TREE CANOPY COVERAGE (%): 35-70 (45)
STAND GBA (SQ FT/ACRE): 44-70 (54)

SPECIES	NO. PLOTS	BASAL AREA	AGE	SITE INDEX	GBA	PROD. INDEX
PIPO	7	60/21	174/27	61/12	55/8	15/4

Veg. Composition: Ponderosa pine and western juniper form a forest savannah over the mountain-mahogany (CELE and bitterbrush (PUTR) shrub layer. Ross' sedge (CARO) and Wheeler's bluegrass (PONE) dominate the herbaceou vegetation. Western groundsel (SEIN) is the most frequently encountered forb.

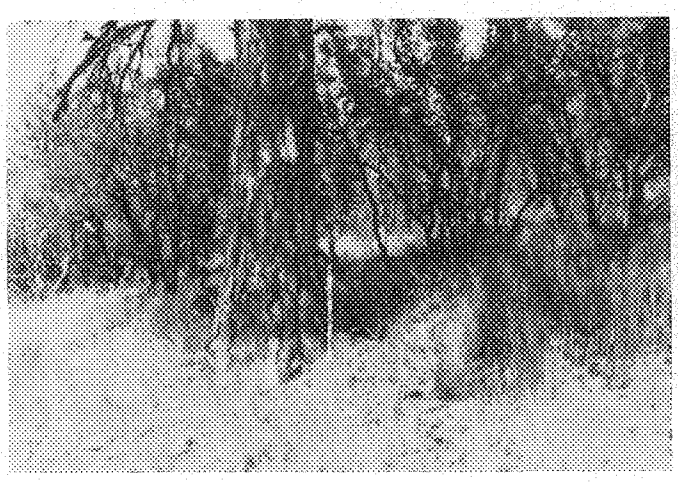
Typal Comparisons: The PIPO/CELE plant communities were found on the rhyolitic tuffs of the Ochoco and souther Blue Mountains at moderate elevations on gentle ridgetops and upper slope locations. Soils were shallow to moderatel deep over flow rhyolite. This association is among the lowest sites for PIPO of the series, similar to PIPO/FEI PIPO/AGSP, and PIPO/CELE/FEID-AGSP.

Successional Relationships: Fire may cause extensive mortality to the mountain-mahogany - bitterbrush shrub laye Disturbance would tend to favor juniper, bottlebrush squirreltail (SIHY), western needlegrass (STOC), yarrow (ACMI and phlox.

Management Considerations: Sites supporting this type are highly valued for winter range; they are used by big gam especially deer. Intensity of use may severely affect recruitment of CELE. Use of prescribed fire may severely alter th community. Employ silvicultural treatment to promote uneven-aged and open forest character of these communitie This type is one of the lowest herbage-producing plant communities of the ponderosa pine series.

Relationship to Other Studies: This plant association has not been previously described.

Ponderosa pine/mountain-mahogany/Idaho fescue-bluebunch wheatgrass plant association
Pinus ponderosa/Cercocarpus ledifolius/Festuca idahoensis- Agropyron spicatum
PIPO/CELE/FEID-AGSP (CPS2 34)



Alkali Creek (Burns RD, Malheur NF)

Table of Principal Species (n = 5)

Species	Code	Mean Cov (%)	Cons. (%)	Range
ponderosa pine	PIPO	16	100	8-30
western juniper	JUOC	10	40	8-11
Douglas-fir	PSME	2	60	2-3
mountain-mahogany	CELE	16	100	10-25
bitterbrush	PUTR	3	40	1-4
common snowberry	SYAL	1	60	1-1
green rabbitbrush	CHVI	1	60	1-1
mountain big sagebrush	ARTRV	7	60	1-15
bluebunch wheatgrass	AGSP	13	100	4-35
Idaho fescue	FEID	24	80	2-38
elk sedge	CAGE	2	40	1-3
Sandberg's bluegrass	POSA3	13	100	7-30
bottlebrush squirreltail	SIHY	3	60	1-5
yarrow	ACMIL	2	80	2-3
pale agoseris	AGGL	2	60	1-3
creamy buckwheat	ERHE	2	60	1-3
arrowleaf balsamroot	BASA	2	40	1-2
phlox	PHLOX	2	40	2-2
hot rock penstemon	PEDED	2	40	1-2

ENVIRONMENT
LOCATION: Central, south
ELEVATION: 4250-5950 ft. (5010 ft.)
ASPECT: All aspects
SLOPE: 15-50% (32%)
TERRAIN FEATURES: Upper or middle 1/3 of slope on all surfaces in steep, rough to rolling or undulating terrain.
SOIL DEPTH: 14-32 in. (23 in.)
ASH DEPTH:
SURFACE SOIL TEXTURES: sandy loam, silt loam
SUBSURFACE SOIL TEXTURES: sandy loam, silt loam, silty clay loam, clay loam
COARSE FRAGMENTS: 25-65% (45%)
PARENT MATERIAL: Residuum and colluvium of igneous, sedimentary, and metamorphic rocks.

UTILIZATION RESPONSE
D - FEID, AGSP, CAGE, CELE, PUTR
IP - POSA3, BASA, SYAL
IU - SIHY, ACMIL, ERHE
INV - CHVI, ARTRV

STAND AND OVERSTORY ATTRIBUTES (n = 3)
HERBAGE PRODUCTION (LBS/ACRE AIR DRY): 303-400 (365)
TOTAL BASAL AREA (SQ FT/ACRE): 30-63 (44)
TREE CANOPY COVERAGE (%): 16-30 (22)
STAND GBA (SQ FT/ACRE): 30-75 (48)

SPECIES	NO. PLOTS	BASAL AREA	AGE	SITE INDEX	GBA	PROD. INDEX
PIPO	3	35/13	175/180	51/30	48/56	11/21

Veg. Composition: This plant association is the warmest, driest of the three PIPO/CELE plant associations. Ponderosa pine forms an open forest with western juniper. Mountain-mahogany (CELE), bitterbrush (PUTR), mountain big sagebrush (ARTRV) and common snowberry (SYAL) from a diverse shrub layer. The herbaceous layer is dominated by bunchgrasses (FEID, AGSP, POSA3). Elk sedge may occur at lower coverage. Forbs are weakly present.

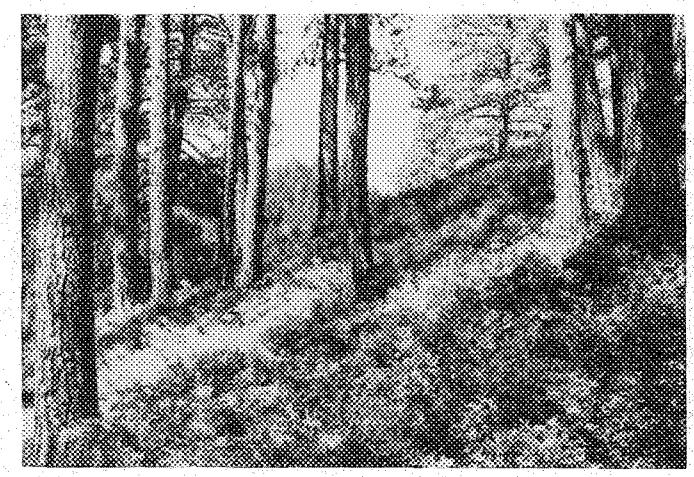
Typal Comparisons: PIPO/CELE/FEID-AGSP occurs on moderate to steep slopes at mid elevations in the central and southern Blue and Ochoco Mountains. Soils are moderately deep to deep overlying rhyolitic tuff, andesite or sedimentary rock. This is the least productive association of the PIPO series with very low production similar to PIPO/CELE/PONE, PIPO/FEID, and PIPO/AGSP.

Successional Relationships: Fire tends to limit bitterbrush and mountain-mahogany. Overgrazing may encourage annual bromes, phlox, arrowleaf balsamroot (BASA), creamy buckwheat (ERHE), needlegrass (STOC), bottlebrush squirreltail (SIHY), yarrow (ACMIL), and reduce bunchgrasses (FEID, AGSP).

Management Considerations: This type is a highly valued community as winter range for big game, especially deer. Ungulate use may severely limit the recruitment of CELE. Prescribed burning may significantly alter these communities. Bunchgrasses are promoted by cool surface fire; bitterbrush and mountain-mahogany are reduced. Selective harvest and unevenaged management promotes the all-aged pine composition.

Relationship to Other Studies: This plant association has not been previously described.

Ponderosa pine/common snowberry plant association
Pinus ponderosa/Symphoricarpos albus
PIPO/SYAL (CPS5 24)



Tucannon River Canyon (Pomeroy RD, Umatilla NF)

Table of Principal Species (n = 16)

Species	Code	Mean Cov (%)	Cons. (%)	Range
ponderosa pine	PIPO	35	100	7-65
Douglas-fir	PSME	2	37	1-3
western juniper	JUOC	3	25	1-10
common snowberry	SYAL	32	100	5-80
spiraea	SPBE	8	50	1-30
baldhip rose	ROGY	6	56	1-20
serviceberry	AMAL	4	43	1-10
creeping Oregon-grape	BERE	2	37	1-5
elk sedge	CAGE	13	93	1-40
pinegrass	CARU	27	56	5-70
mountain brome	BRCA	4	37	1-15
blue wildrye	ELGL	5	37	1-10
Wheeler's bluegrass	PONE	5	31	1-10
Idaho fescue	FEID	10	25	1-30
western needlegrass	STOC	3	25	1-8
tailcup lupine	LUCA	2	37	1-5
broadpetal strawberry	FRVI	2	31	1-4
heartleaf arnica	ARCO	7	43	1-20
sticky geranium	GEVI	2	37	1-4
vetch	VIAM	7	31	1-15
yarrow	ACMIL	2	68	1-3

ENVIRONMENT
LOCATION: North, central
ELEVATION: 2475-5250 ft. (3995 ft.)
ASPECT: All aspects
SLOPE: 3-50% (19%)
TERRAIN FEATURES: Upper, middle, or lower 1/3 of slope on all surfaces in steep, rolling to undulating terrain.
SOIL DEPTH: 32-80 in. (43 in.)
ASH DEPTH:
SURFACE SOIL TEXTURES: sandy loam, silt loam, silt
SUBSURFACE SOIL TEXTURES: sandy loam, silt loam, silt, clay loam, clay
COARSE FRAGMENTS: 25-52% (36%)
PARENT MATERIAL: Residuum and colluvium of igneous, sedimentary, and metamorphic rocks, some with a mantle of ash and/or loess.

UTILIZATION RESPONSE
D - CAGE, AMAL
IP - CARU, BRCA, ELGL, GEVI
IU - LUCA, FRVI, ARCO, ACMIL
INV - VIAM

STAND AND OVERSTORY ATTRIBUTES (n = 16)
HERBAGE PRODUCTION (LBS/ACRE AIR DRY): 175-1500 (582)
TOTAL BASAL AREA (SQ FT/ACRE): 64-177 (116)
TREE CANOPY COVERAGE (%): 7-65 (37)
STAND GBA (SQ FT/ACRE): 76-243 (155)

SPECIES	NO. PLOTS	BASAL AREA	AGE	SITE INDEX	GBA	PROD. INDEX
PIPO	10	114/27	113/48	94/13	154/40	70/29

Veg. Composition: Ponderosa pine is climax; Douglas-fir may occur at low coverage. Common snowberry, spiraea (SPBE), baldhip rose (ROGY) and serviceberry (AMAL) are principal shrub components. Elk sedge is the principal herb. Shrubs are usually present at lower coverages unless the understory has been disturbed.

Typal Comparisons: PIPO/SYAL occurs at the lowest mean elevation of any PIPO plant association (3995 ft.). It occurs principally in the north and central Blue Mountains on gentle to steep slopes at all slope positions. It occurs on deep soils over varying geologic substates. The PIPO/SYAL community occurs on the deepest soils of any PIPO series vegetation and is considered the most mesic of the PIPO plant associations. Site index, stockability, and the productivity index are the highest of the PIPO series.

Successional Relationships: Mountain brome (BRCA) and blue wildrye (ELGL) are grasses that tend to increase with disturbance. Forbs which may be more abundant at lower seral stages are vetch (VIAM), heartleaf arnica (ARCO), tailcup lupine (LUCA) and yarrow (ACMIL).

Management Considerations: Tree regeneration success is limited by SYAL, CARU, and CAGE competition. Clumps of pine regeneration can cause stagnation requiring stocking level control. Ungulate use is high (proximity is to adjacent bunchgrass). CARU used late in season after frost; SYAL use is high by deer, elk, grouse, and passerines. Often used for bedding and shading. Fire promotes CARU, PIPO regeneration and bunchgrasses. Use of prescribed fire promotes vigor of rhizomatous shrub, grass, forb species. Additionally, fire maintains community vigor and develops the uneven-aged character of the PIPO/SYAL plant community. This is one of the highest herbage producing plant associations of the ponderosa pine series.

Relationship to Other Studies: The PIPO/SYAL h.t. was described by Daubenmire (1968) in eastern Washington and north Idaho; Pfister, et al (1977) in Montana; Steele (1981) in central Idaho; Cooper, et al (1987) in north Idaho; Johnson and Simon (1987) in the Wallowa-Snake of northeast Oregon; Clausnitzer and Zamora (1987) on the Colville Indian Reservation of northern Washington.

Plant Associations of the Blue and Ochoco Mountains

by: Charles Grier Johnson, Jr.
Rodrick R. Clausnitzer

PHOTO CREDITS

Cover: Late summer view of southern Blue Mountains from Strawberry Mountain - C.G. Johnson Jr.

Title Page: View from Monument Rock toward Ironside Mountain - C.G. Johnson Jr.

Photos by F.C. Hall:
Pages 25, 29, 33, 35, 37, 49, 61, 63, 67, 69, 73, 79, 81, 83, 89, 91, 93, 99, 105, 113, 115, 119, 131, 143, 155

Photos by C.G. Johnson:
Pages 27, 31, 45, 47, 51, 53, 55, 57, 59, 65, 71, 85, 87, 97, 101, 103, 107, 109, 111, 117, 121, 125, 127, 133, 135, 137, 139, 141, 145, 151, 153

PREFACE

The Blue and Ochoco Mountains were first sampled for ecological classification purposes by Fred Hall in the 1950s and 1960s. His energy and vision resulted in the first publication of plant community types for the Region. The basic choices of where to put a plot and how to characterize the vegetation of the Blue and Ochoco Mountains was determined by Fred. We have inherited his data, added a few new plots, and designed a new classification. We'd like to express our appreciation for the assistance Fred has given in the fundamental data acquisition, the hypotheses he has formed about the types, and the pioneering pathway he forged in providing the first ecologic document for land managers on the Malheur, Ochoco, Umatilla and Wallowa-Whitman National Forests.

In the past 2 years the classification effort for the Blue and Ochoco Mountains has been a team effort. We have produced a 1990 classification review draft, a 1991 publication review draft, and finally this 1991 field guide. In producing the 2 review drafts and this final publication, we have had excellent facilitiation from Dr. Len Volland, Regional Ecologist; Chuck Ernst; Bill Gast; and our Area 3 Forest Supervisors (Bob Richmond, Mark Boche, Jim Lawrence, and Jeff Blackwood). Two formal field reviews were held with many ideas for improvement of the classification and format of the field guide resulting. The two review drafts were reproduced for field training and use by the employees of the Area with excellent help from the word processing and document reproduction units of the four National Forest Supervisors' Offices.

The placing of the numbers and words onto the printed page has evolved into an electronic computerized world where *the skills of the word processing specialist directly influence the appearance and utility of the final document. We have* been fortunate to have some very dedicated and extremely helpful word processing people in the production of our field guide. Our heartfelt gratitude to Vicki Medlin for her supervision and to Kathy Hottle and Paula McBroom for their wisdom *and professional attitude as well as those nimble fingers!*

This classification and field guide is dedicated to our families and posthumously to Terri Cummings - a dedicated Forest *Service employee we lost before she could help us complete this project.*

Charlie and Rod

Plant Associations of the
Blue and Ochoco Mountains

Table of Contents

PONDEROSA PINE SERIES

JUNIPER WOODLANDS

SHRUBLANDS

INTRODUCTION

The Blue and Ochoco Mountains Plant Association Classification Field Guide is provided for use by resource managers on land administered by the Forest Service of the Malheur, Ochoco, Umatilla, and Wallowa-Whitman National Forests. This is the second classification of the vegetation of the Blue and Ochoco Mountains. It is a combined revision of the 1973 Plant Community Type classification authored by Dr. Frederick C. Hall as well as a new classification for kinds of vegetation not included in the earlier work (see Appendix A). This classification was developed with a concept similar to that used in the development of the Wallowa-Snake Plant Associations completed in 1987 by Johnson and Simon. The conceptual approach for these investigations is based on providing the field investigator with a floristic indicator species which is diagnostic of a particular environment. That environment in turn has a capability of providing a defined plant community which has been described in the pages that follow.

The descriptions focus on mid to late seral vegetation of the uplands; but also included are descriptions of early seral vegetation commonly found in the Blue and Ochoco Mountains. Earlier seral upland vegetation is being studied as a series of investigations by ecologists working on the four National Forests. Publications relative to earlier seral vegetation will provide emphasis on successional pathways, response to management and successional stage identification. The number of sampled plots in the subalpine of the Blue, Ochoco and Wallowa Mountains requires that more investigation be completed before describing subalpine plant associations; this effort is being conducted on the Malheur, Umatilla, and Wallowa-Whitman. Lastly, the wetland vegetation has not been adequately studied to date. This classification effort has deferred all sampled wetland plots for inclusion with the forthcoming investigation and publication of a riparian classification for the Blue and Wallowa Mountains.

This is not the final classification of the Blue and Ochoco Mountains vegetation. This field guide is designed to provide the professional land manager with enough basic information to adequately identify classified vegetation types and have summary information available for incorporation into findings for good land management decisions. The next classification of the area can be improved by periodic communication with the authors of this guide to enable them to make necessary corrections, incorporate new sampled plot data and re-design the next classification as needed. The authors sincerely hope this 1991 classification will improve our caring for the various natural resources inherent in the ecosystems of the four National Forests.

GEOGRAPHY

The Blue and Ochoco Mountains are part of the Blue Mountains physiographic division which includes the Ochoco Mountains, Strawberry-Aldrich Range, Greenhorn Mountains, Elkhorn Mountains, Wallowa Mountains and the tristate uplands (Baldwin 1964). The Blue Mountains segment is a northeast to southwest trending axis of "old" mountains that begin south of Pomeroy, Washington and end 200 miles to the south near Burns, Oregon. A 50-mile long east-west spur occurs west of Ukiah, Oregon and ends near Fossil, Oregon. The Ochoco Mountains are another east-west trending axis that occur north of Prineville, Oregon and end 60 miles to the east at the South Fork John Day River canyon.

The Blue Mountains physiographic province was divided into three segments for help in portraying the probable distribution of vegetation classified in this guide. The segments are as follows:

North - The mountainous area North of I-84 (running between La Grande and Pendleton).
Central - The mountainous area South of I-84 and North of Hwy 26 (running between Unity and Prineville).
South - The mountainous area South of Hwy 26.

Some of the higher summits of the Blue Mountains are as follows:

Northern Blue Mountains - Oregon Butte (6401 ft.), Mt. Emily (6064 ft.)

Central Blue Mountains - Vinegar Hill (8131 ft.), Elkhorn Peak (8931 ft.)

Southern Blue Mountains - Strawberry Mountains (9038 ft.), Fields Peak (7363 ft.)

Ochoco Mountains - Round Mountain (6753 ft.), Spanish Peak (6885 ft.)

The lowest elevations occur in the northern Blue Mountains where major canyons incise the mountainous topography. The Tucannon River, the Umatilla River, and Mill Creek all exit the national forest at approximately 2300 ft. elevation. Major rivers in the Blue-Ochoco Mountains are the John Day, with its several branches draining much of the western half of the Blue Mountains; the Grande Ronde and Powder Rivers and tributaries draining much of the eastern half of the Blue Mountains; the Umatilla, Walla Walla, Touche, Tucannon, and Wenaha rivers draining much of the northern portion of the Blue Mountains; and the Malheur and its many tributaries draining the southern end of the Blues. The Crooked River drains much of the Ochoco Mountain uplift.

GEOLOGY

Columbia River basalts were formed in the Cenozoic Era (65 million years ago) by extensive vulcanism. In the late Cenozoic the Blue Mountains were uplifted with folding and faulting of the ranges. Prior to the Cenozoic (in the Paleozoic - 250 million years ago) marine sandstones, shale, cherts, and limestone were formed. These oldest rocks of the Blue-Ochocos are found near the head of the Crooked River.

The Mesozoic Era (225-65 million years ago) provided the serpentine of the Strawberry Range; especially noticeable from Indian Creek to Canyon Mountain. In the Cretaceous Period (near the end of the Mesozoic) intrusive rocks were formed with major ore deposition in the Elkhorns, Greenhorns, and Strawberry Ranges. These granodiorites provided the gold and silver which brought the initial miners and started settlements in this area.

The Cenozoic Era provided much of the visible landscape of the Blue and Ochoco Mountains. In the Eocene (35-40 million years ago) the Clarno and John Day formations were deposited by the Blue Mountain volcanoes. The formations consisted of thick rhyolites, breccias, tuffs and basaltic flows. The southwestern portion of the Blue Mountains and most of the Ochoco Mountains are covered by deposits of the Clarno Formation. In the mid Miocene thick layers of lava extruded from fissures in local volcanoes and flooded the landscape. Lava pooled to depths of 50 feet or greater with multiple episodes resulting in layers of basalt more than 2000 feet thick (McKee, 1972). These are known collectively as Columbia River basalts and cover most of the area contained within the Blue Mountains today. A localized center of vulcanism produced the Strawberry Volcanics which covers the Strawberry Mountains to depths of 6500 feet eastward from Indian Creek.

Pleistocene (2-3 million years ago) was an epoch of erosion in this area. Sumpter Valley is an example of deposition made during the Pleistocene of alluvial sand and gravel. Wind deposited loess from the central Washington Basin occurs on portions of the northern Blue Mountains providing highly productive grasslands and shrublands.

Alpine glaciation occurred in the Elkhorns, Greenhorns, and Strawberry Mountains during the Pleistocene. About 12,000 years ago Glacier Peak sent ash eastward which blanketed the Blue Mountains. Then approximately 6,000 years ago, Mt. Mazama erupted sandy volcanic ash to again cover parts of the Blue and Ochoco Mountains (Fryxell, 1965). These ash deposits were then redeposited by wind and water to provide the growing medium for some of our most important and productive plant communities.

SOIL CHARACTERISTICS

Soils of the Blue and Ochoco Mountains are quite variable and may range from those on thin, rocky, low-productivity ridgetop scablands to those in deep ash accumulations on very productive grand fir sites. Soil differences result from variations in climate, topography, parent material, vegetation, and time. The greatest influence to soils in this area has come from ash deposited primarily from Mt. Mazama and Glacier Peak approximately 6,600 and 12,000 years ago respectively (Fryxell, 1965). Perhaps of equal impact, especially in the northern dissected basalt plateau, has been the deposition of loess from the central Washington channeled scablands region prior to and following glaciation during the Pleistocene (1 million years ago); over time much of the material has been eroded away by wind and water (USDA, 1985). Continued weathering of the basalts and other rock types has resulted in a mixing of wind-borne ash and loess with rocky colluvium in many areas. Consequently, soils fall under one of the following broad categories:

1. Residual - derived in place from predominately bedrock or colluvial rock materials.
2. Ash-Loess - derived from deposited and accumulated ash and/or loess over older buried soil material.
3. Mixed - derived from colluvium, ash and/or loess mixed well in surface layers over older buried soil material (Johnson and Simon, 1987).

Of the varied geologic material available for soil formation, basalt and andesite are the most common in the Blue and Ochoco Mountains. Residual soils formed from these materials differ from the volcanic ash and loessial soils in several respects: 1) finer textured in the upper profile, 2) increased structure, 3) higher coarse fragments, 4) lower water-holding capacity, and 5) higher bulk densities. Other materials provide locally important substrates that impart characteristic attributes to soils; as, the occurrence of rhyolitic rock and subsequent low soil nutrient status.

Productivity of forested and non-forested plant communities is closely related to ash and loess content in soils. Unique characteristics of ash soils include: 1) high water holding capacity, 2) high water infiltration rates, 3) low compactability, 4) high detachability, and 5) disproportionately high amounts of nutrients in upper surface layers. Under undisturbed conditions these soils support good vegetation cover which protects the ash from erosion (USDA, 1985).

Loess may also provide important qualities to many soils. Loessial deposits are normally: 1) high in base saturation (can hold a large amount of nutrients), 2) have high content of weathered minerals and are thus high in nutrient reserve, and 3) generally have excellent physical properties (Johnson and Simon, 1987).

Soil characteristics related to parent material interact with other environmental factors to define the distributional limits of plant communities and their individual plant species.

CLIMATE

The relief of the Blue and Ochoco Mountains creates several localized climatic affects. The diversity of landscapes between mountain ranges, rolling topography and deep, dissected canyons influences local climatic patterns. But, the major influence to the regional climate is provided by the Cascade Mountains lying nearly 200 miles to the west. This mountain range forms a barrier against potential modifying effects of warm, moist fronts emanating out of the Pacific Ocean. As a result, the overall climate of the Blue and Ochoco Mountains is labelled Temperate Continental - cool summer phase (Trewartha, 1968). Mean temperature is less than 72 degrees F. in the warmest month and 50 degrees F. for more than three months. Light precipitation, low relative humidity, rapid evaporation, abundant sunshine, and wide temperature and precipitation fluctuations are characteristics of this climate.

A break in the Cascadian barrier is provided by the Columbia River gorge. This topographic feature and the associated Columbia River provide an opportunity for marine climatic conditions to reach the northern Blue Mountains and strongly influence the vegetation. This climate is labeled Temperate Oceanic (Trewartha, 1968) and differs significantly from the Temperate Continental climate in providing greater cloudiness, increased precipitation and higher relative humidities with less fluctuation in winter temperatures. The oceanic influence provides the environment for vegetation more common to the western Cascades to occupy portions of the northern and northwestern Blue Mountains. Examples of this vegetation are grand fir/sword fern-ginger, grand fir/oakfern and grand fir/false bugbane.

The high percentage of cloud days attributed to the Temperate Oceanic climate, versus the high percentage of clear, winter days and nights of Temperate Continental climates, has dramatically influenced the kind of vegetation found in the northern Blue Mountains as contrasted to that found commonly in the southern Blue and Ochoco Mountains. Daubenmire (1956) determined that the oceanic climate promoted the grasslands and rhizomatous shrublands characteristically found in the foothills, slopes and ridgetops of the Blue Mountains adjacent to the Palouse. The continental climate, on the other hand, promotes sagebrush and juniper so commonly found in the Great Basin to the south of the Blue and Ochoco Mountains.

The majority of annual precipitation falls as snow during winter. Late summer and early autumn provide the area with convectional storms resulting from masses of cool air crossing the Cascades and passing over the Blue and Ochoco Mountains at high elevations. The hot, dry surface air violently mixes with this cool, moist upper air mass to provide lightening storms. These events have provided a cyclic, annual abundance of natural fires. The fires historically burned extensively and provided the renovating and rejuvenating force behind the development and composition of Blue Mountain and Ochoco Mountain vegetation. The haze of late summer and the particulates in the air from Blue Mountain fires combined to give a hue to the ridges as seen from afar. Thus early settlers named the Blue Mountains.

THE PLANT ASSOCIATION CONCEPT

The Blue-Ochoco Mountain classification has been developed using the plant association concept for characterizing vegetation based on successional relationships and probable climax species. The following definitions and examples may provide assistance to the field guide user to better understand the categorizations given to the vegetation.

Plant Communities

The plant community is a general term for an assemblage of plants living together and interacting among themselves in a specific location (R6 Ecology Glossary Committee, 1989). It is not a taxonomic unit, has no successional status, and may not be recognized by all investigators. Analagous to "plant communities" are "common names" where no bounds have been set or rules defined by which a particular common name is used. Many plant communities have been sampled which differ in compositional and/or environmental parameters.

The purpose of this classification is to segment the moisture-temperature gradient through recognition of indicative plant species in such a way as to provide easier recognition of similar environments across the landscape. In the analysis of plot data, certain plant communities were undersampled or did not provide adequate representation in the geographic area encompassed by the classification. These "communities" have been given a minimal description and entered in the text and key to recognize the fact that they exist. More information is needed in order to change their status of "community" or incidental vegetation.

Plant Community Types

The plant community type, or p.c.t., is an aggregation of plant communities with similar structure and floristic composition (R6 Ecology Glossary Committee, 1989).

In the Blue-Ochoco Mountains the magnitude of lodgepole pine communities has provided empetus for the description of plant community types based on their regular and repeated occurrence. Other vegetation, AGSP-POSA3-DAUN p.c.t. for example, was sampled enough to demonstrate a pattern but did not meet the standard necessary for plant association status. For this classification, a minimum of four plots was generally used as that sample size where enough information was available to determine plant association status. Ideally, ten plots or more are used to portray a plant association.

Successional Terminology

"Climax" plants are those that are self perpetuating in their environment in the absence of perturbating, degenerating or disturbing influences. Stability with the environment is crucial to the succession of plant communities that ameliorate a site and permit the establishment and maintenance of the "climax community".

In vegetation sampling, ecologists seek those stands which appear to demonstrate stability in order to understand the plant composition and environments which can be characterized in a plant association classification, i.e., a classification of potential natural vegetation.

However, the landscape in the Blue-Ochoco Mountains has undergone, and continues to undergo, modifications that prevent the formation of long-term stable communities. Some natural events (fire, windstorms, browsing animals, flooding) as well as human-induced activities (timber harvest operations, livestock grazing) tend to forestall or disrupt the natural development of vegetation leading to communities with more stable composition and structure.

Succession may be arrested (i.e., maintained by fire at a particular stage), accelerated (i.e., mortality of seral tree species from insects, diseases, windthrow), and retarded (i.e., continued ungulate grazing pressure which degrades the grassland from perennial to annual vegetation dominance).

The identifiable stages of vegetation preceding climax communities are termed "seral stages". In the development of this classification, plots representing various seral stages were used to define "plant community types" as well as the "plant associations". Generally, very early and early seral stages were grouped into plant community types; mid and late seral stages were grouped to define plant associations, since they depict the least change over time and therefore have a more stable composition and structure over time.

Plant Associations

If a stand of vegetation is able to develop and persist in its environment, and if the competitive forces are without major disturbing influences, then following a relatively long period of time those plants capable of reproducing in competition will constitute the "climax community". The unit of classification based on the probable, or projected, climax community type is defined as the "plant association" (R6 Ecology Glossary Committee, 1989). As a combination of similar or compensating environmental factors are repeated across the landscape, a predictable plant community will occupy those sites given time and the lack of disturbance. This will be a climax community comprising the basis for the plant association classification.

Plant associations and plant community types are abstract classification terms. Plant communities, on the other hand, are concrete entities on the landscape, just as a stand of trees, grasses, or shrubland vegetation is recognizable and tangible to the field investigator.

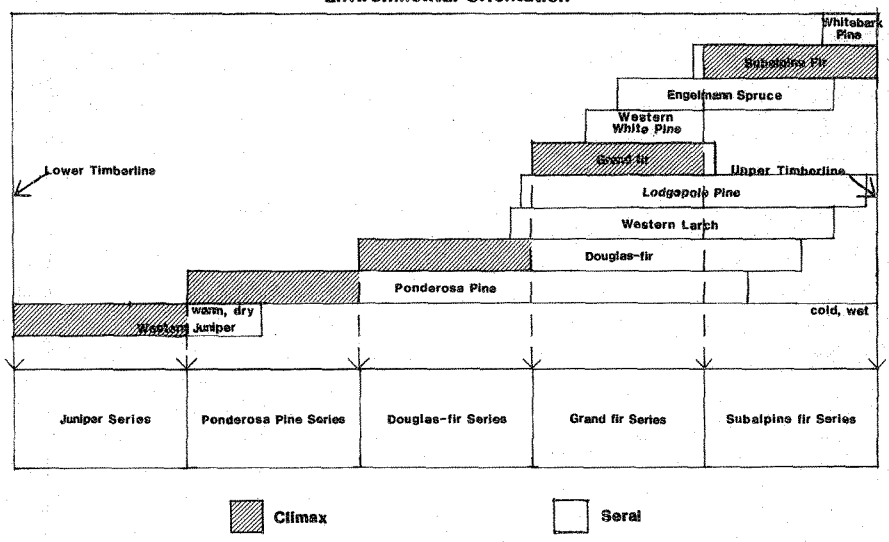
Series

This field guide aggregates the taxonomically related plant associations into series. The name of the series is that of the climax species dominating the principal layer. An example would be the grand fir series in which all ABGR plant associations are arrayed, as well as the seral plant community types and community fragments, related to grand fir climax vegetation.

Zonal Relationships

Individual species occur in a predictable pattern, or juxtaposition, with a unit of area based on the micro environment. Plant associations likewise will tend to occupy predictable positions in a landscape based on habitat features favorable to support the climax community. The principal tree species which constitute the climax dominants predictably occupy environmental zones within a climatic gradient where temperature and moisture vary with change in elevation. Figure 1 (below), depicts the tree species of the Blue and Ochoco Mountains as they would orient from cool, moist to warm, dry environmental conditions on a hypothetical mountain slope. Here whitebark pine culminates the summit at the limits of tree growth and western juniper defines the lower limits of tree growth at the edge of the cold desert steppe. Where the distributional limits of the tree species include climax conditions, the bar graph is "cross hatched."

Fig. 1 - Tree Species of the Blue and Ochoco Mountains Environmental Orientation



INDICATOR SPECIES

The habitat needs of plant species is manifested by certain kinds of environment. Some species require stable conditions, others thrive on reoccurring instability. Some species have adapted to a particular locale due to long-term climatic conditions of the area; others have colonized and thrived due to changes in the microclimate of a particular site. Synecological investigation is rooted in knowledge of the local flora. Constant improvement of this knowledge is essential to understanding plant-environment relationships, and developing and testing hypotheses concerning species occurrence and development.

Having developed hypotheses of plant-environment relationships, the ecologist seeks to identify groupings of plants indicative of similar environments. It is this exercise which leads to the definition of plant community types and plant associations. This process includes review of similar ecological work from adjacent geographic areas in order to ascertain the degree of similarity or dissimilarity which has been afforded to a particular vegetation type. The commonality between investigators is the use of plants to indicate a kind of plant community that is defined by a specific set of environmental parameters. The plants selected to define the plant community type or plant association are those deemed to be the most diagnostic of a particular environment. These are called "indicator plants". While they do not necessarily indicate the sum of all environmental conditions, they are considered the best candidates of the associated flora within a classified type to indicate the occurrence and distribution of that vegetation unit.

Selection of indicative plant species is based on repeated observations; many of which are recorded by plot establishment and data gathering work. Environmental factors are used to determine the ability of a diagnostic plant to represent a type. Examples are -- waterholding capacity, slope position, microrelief, and elevation. Additionally, the relative productivity and growth performance of certain species have often been used to help indicate the type assignment which the indicator plant has suggested. The utility to land management is also given consideration in the selection of certain indicator plants (e.g., Pacific yew in ABGR/CLUN communities where environments and productivities may not be significantly different). Once data are derived and the information is arrayed, the common plant groupings are arranged in repetitive fashion until similar community types are created. The response of plants to disturbance is a factor in the placement of certain plots to a given classification unit based on the degree of ground disturbance, the composition of plant species, and the apparent age or time elapsing from the last significant disturbance.

The indicator species selected are those sought by field investigators to help determine proper assignment to a given plant association or plant community type. A separate field guide to the "Principal Indicator Species of National Forests in Northeastern Oregon and Southeastern Washington" aids the investigator working on the Malheur, Umatilla, and Wallowa-Whitman National Forests. "Major Indicator Shrubs and Herbs on National Forests of Eastern Oregon" will be especially helpful to field investigators working on the Ochoco National Forest.

DATA ANALYSES

Data analyses were accomplished with computer programs developed or adapted by Region 6 ecologists (Volland and Connelly, 1978 and Wheeler, 1987). Following an initial data preparation phase, a series of subjective group orderings were created with consideration given to previous classification efforts in northeastern Oregon and adjacent national forest lands (Hall, 1973; and Johnson and Simon, 1987).

Additionally, ordination and classification programs, DECORANA and TWINSPAN (Hill, 1979), were used to develop concepts of classification group membership, species ecological amplitudes, and temperature and moisture gradients encountered within a series. Displays of these gradients, along with productivity indices, were inspected to adjust previously developed units (plant associations and plant community types). Plot memberships were derived and stand association tables with summary statistics produced.

Subsequently, groups were subjected to a multivariate procedure called stepwise discriminant analysis (BMDO7M Program). During this phase of analyses, site variables and floristic attributes were statistically screened for the most "characteristic" to use in the classification. Then group membership hypotheses were tested and memberships adjusted. These final revisions were incorporated into association tables and statistical summaries which are represented in the individual plant association descriptions and the appendices.

WETLAND VEGETATION

This classification of the Blue and Ochoco Mountain Plant Associations is an upland-oriented treatment of that vegetation principally representative of later seral stages in the forests, grasslands, and shrublands. The field investigator will be unable to classify meadows and riparian communities using the keys of this field guide. The 1973 Blue Mountain classification (Hall 1973) included five classified meadows and riparian communities. These were not addressed in this publication because of sample size and/or lack of data. Until the wetlands are classified in AREA 3, field investigators on the Malheur, Umatilla, and Wallowa-Whitman National Forests may refer to the classification of riparian vegetation conducted by Bud Kovalchik on the Ochoco, Deschutes, Winema, and Fremont National Forests (Kovalchik 1987). The listing of wetland types and assigned ECOCLASS codes from the 1973 classification is as follows:

Dry Meadow (MD)
Moist Meadow (MM)
Wet Meadow (MW)
Quaking Aspen Meadow (HQ-M1)
Ponderosa Pine-Blue Wildrye (CP-M1-11)

EARLY SERAL VEGETATION, DISCLIMAX COMMUNITIES AND ECOTONES

The landscape of the Blue Mountain and Ochoco Mountain national forests is in a constant state of change and modification from the natural. Therefore, plant communities will be encountered which will not readily key using this classification. Some early seral plant community types have been presented. The treatment is far from complete. Successional studies are in progress to interpret the perturbated lands and provide early seral stages of the principal plant associations of the Area. A disturbance key for early seral, very early seral, and disclimactic vegetation would not contain the variation found in the plant communities of the area.

The area of transition between the vegetation of two or more plant associations is termed an ecotone. Up to 40% of the time a field plot tends to occur in an ecotone. The investigator is urged to either move to an adjacent area to determine the plant association or to treat the ecotonal location as a complex by determining the plant associations represented and either labelling one as primary, the other secondary, or giving a percentage split (i.e., 60/40, 50/50, 70/30) for the site.

USE OF THE FIELD GUIDE

Nomenclature:

The plant associations and plant community types have been grouped into "series" based on the projected climax species which dominates the principal layer. For example, in the grand fir series, all included plant communities are those in which grand fir is projected as the climax tree species.

Plant associations are named using the climax dominant species followed by a slash (/) and the listing of the subordinate species of a subordinate life form layer or layers (ABGR/TABR/CLUN). A dash (-) is used to separate names of the same life form (ABGR/VASC-LIBO2).

A species name or code in parentheses denotes the climax dominant of a seral plant community type, i.e., PICO (ABGR)/VAME.

All scientific names follow Hitchcock and Cronquist (Flora of the Pacific Northwest, 1973). Species codes follow Garrison et al (PNW-46, Northwest Plant Names and Symbols for Ecosystem Inventory and Analysis, 1976).

Photos:

The reference pole in most pictures is one meter tall and segmented into decimeters to help visualize size of the vegetation.

Sample Size:

The number of plots used to describe the plant associations and plant community types is provided as follows: (n=8).

Table of Principal Species:

This table contains only the primary species of a plant association or plant community type. Mean coverage is provided for the ocular estimates of canopy cover in percent. Averages were calculated by dividing the total foliar cover of a species when it occurred by the number of plots containing that species. Constancy refers to the percentage of frequency of occurrence by a species in the total number of plots used for describing the plant association or plant community type. The range is the spread of coverage values from the lowest value found to the highest.

Environment Table:

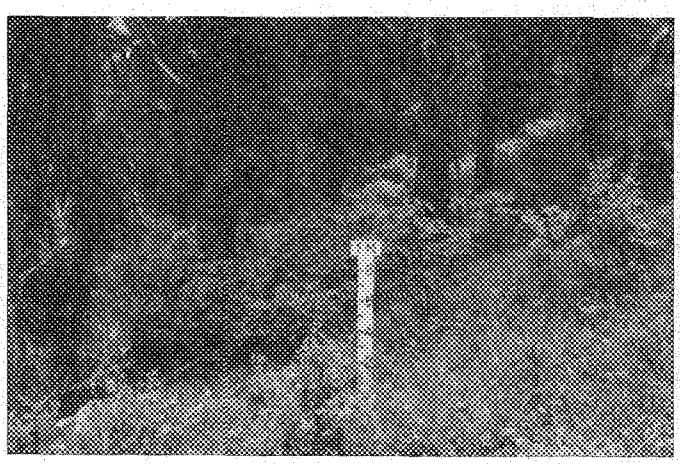
Displayed here are distribution (location) of the vegetation units in the study area, site variables, and soil attributes. The range of values sampled are followed by the mean value in parentheses. The location information (North, Central, South) provides the probable distribution of the various classified types in the Blue and Ochoco Mountains as follows:

North - La Grande RD (North of I-84), Walla Walla RD, Pomeroy RD.
Central - La Grande RD (South of I-84), North Fork John Day RD, Heppner RD, Long Creek RD, and Unity RD (North of Hwy 26).
South - Bear Valley RD, Burns RD, Prairie City RD, Ochoco NF, and Unity RD (South of Hwy 26).

Stand and Overstory Attributes:

Herbage production (above-ground, air dry biomass of forbs, grasses, and sedges), total stand basal area, tree canopy coverage (overstory and understory), and average stand growth basal area are presented. Use stand GBA estimates with caution, as they reflect mixed-species stand conditions. The range (minimum-maximum) is followed by the mean value in parenthesis. Overstory characteristics by species are displayed in the lower table. No. plots = number of plots sampled; Basal area = SQ FT/ACRE; Age= YRS BH; Site index = FT AT 100 YRS; GBA = GROWTH BASAL AREA (SQ FT/ACRE); Productivity Index = SI x GBA x .004. Value to the left of the slash (/) is the mean, to the right is the 95% confidence interval (mean/CI - 95%).

Ponderosa pine/mountain snowberry plant association
Pinus ponderosa/Symphoricarpos oreophilus
PIPO/SYOR (CPS5 25)



Rosebud Creek (Bear Valley RD, Malheur NF)

Table of Principal Species (n = 10)

Species	Code	Mean Cov (%)	Cons. (%)	Range
ponderosa pine	PIPO	38	100	13-58
western juniper	JUOC	4	80	1-5
mountain snowberry	SYOR	22	100	8-35
creeping Oregon-grape	BERE	3	90	1-10
squaw currant	RICE	4	40	1-10
serviceberry	AMAL	2	50	1-5
mountain-mahogany	CELE	3	40	1-5
elk sedge	CAGE	30	100	1-60
Wheeler's bluegrass	PONE	1	30	1-1
western needlegrass	STOC	1	50	1-1
mountain brome	BRCA	2	50	1-5
Idaho fescue	FEID	10	30	5-15
yarrow	ACMIL	4	50	1-10
meadowrue	THOC	7	30	1-15

ENVIRONMENT
LOCATION: Central, south
ELEVATION: 4380-5600 ft. (5260 ft.)
ASPECT: Principally southerly exposures
SLOPE: 10-35% (22%)
TERRAIN FEATURES: Upper, middle, or lower 1/3 of slope on flat or convex surfaces in steep, rough to rolling or undulating terrain.
SOIL DEPTH:
ASH DEPTH:
SURFACE SOIL TEXTURES:
SUBSURFACE SOIL TEXTURES:
COARSE FRAGMENTS:
PARENT MATERIAL: Residuum and colluvium of igneous, sedimentary, and metamorphic rocks.

UTILIZATION RESPONSE
D - CAGE, AMAL, CELE
IP - PONE, BRCA, SYOR
IU - STOC, ACMIL
INV - ANNUAL BROMES

STAND AND OVERSTORY ATTRIBUTES (n = 8)
HERBAGE PRODUCTION (LBS/ACRE AIR DRY): 300-600 (431)
TOTAL BASAL AREA (SQ FT/ACRE): 72-100 (87)
TREE CANOPY COVERAGE (%): 14-61 (41)
STAND GBA (SQ. FT/ACRE): 70-146 (109)

SPECIES	NO. PLOTS	BASAL AREA	AGE	SITE INDEX	GBA	PROD. INDEX
PIPO	8	85/11	126/27	80/9	110/28	39/11

Veg. Composition: Ponderosa pine and western juniper are highly associated. Mountain snowberry (SYOR) is the dominant shrub with Oregon-grape (BERE) usually present. The herbaceous composition is dominated by elk sedge (CAGE). Other herbaceous plants are few and occur at low coverages.

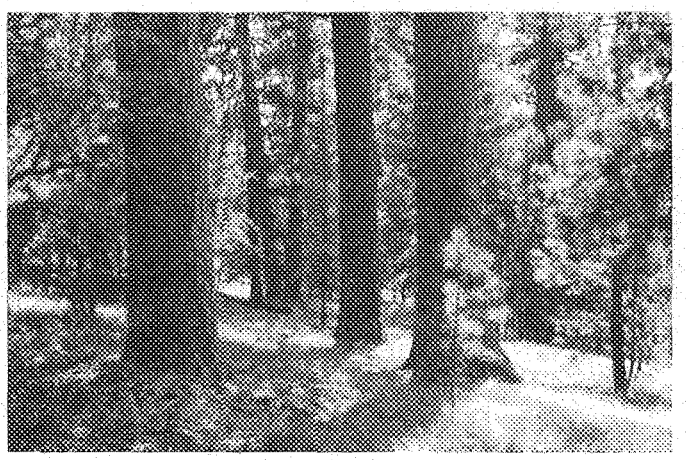
Typal Comparisons: The PIPO/SYOR plant association occurs principally in the central and southern Blue and Ochoco Mountains on gentle to moderate slopes at all slope positions. Mountain snowberry communities are considered to be drier than common snowberry communities when ponderosa pine is climax. In Douglas-fir climax communities, mountain snowberry is considered to reflect warmer, drier conditions than common snowberry. This association has moderate PIPO productivities, similar to PIPO/CARU.

Successional Relationships: Poorly understood. Grazing disturbance would probably enhance the abundance of yarrow (ACMIL), bunchgrasses (FEID, AGSP), creamy buckwheat (ERHE), vetch (VIAM), and mountain brome (BRCA).

Management Considerations: Fire will stimulate and promote shrubs and elk sedge. Primary value of PIPO/SYOR is with the variety of plant species and their utility to wildlife species. Shading and heavy browsing can severely alter these communities. Aggressive invasion and establishment by undesirable plants (i.e., medusahead) occurs in degraded PIPO/SYOR communities. Harvest pine by individual tree selection; limit silvicultural activity for retention of older trees valuable for wildlife and landscape diversity enhancement.

Relationship to Other Studies: The PIPO/SYOR h.t. was first described by Steele (1981) as a minor type in central Idaho. It had not been described for the Blue or Ochoco Mountains previously.

Ponderosa pine/pinegrass plant association
Pinus ponderosa/Calamagrostis rubescens
PIPO/CARU (CPG2 21)



Dugout Creek (Proposed RNA) (Prairie City RD, Malheur NF)

Table of Principal Species (n = 16)

Species	Code	Mean Cov (%)	Cons. (%)	Range
ponderosa pine	PIPO	45	100	17-81
Douglas-fir	PSME	2	56	1-3
western juniper	JUOC	2	25	1-4
common snowberry	SYAL	1	50	1-3
creeping Oregon-grape	BERE	2	37	1-3
spiraea	SPBE	3	43	2-5
baldhip rose	ROGY	2	37	1-3
pinegrass	CARU	38	100	7-70
elk sedge	CAGE	20	87	2-45
Ross' sedge	CARO	3	31	1-7
northwestern sedge	CACO	3	37	1-5
Wheeler's bluegrass	PONE	2	56	1-7
tailcup lupine	LUCA	3	56	1-8
heartleaf arnica	ARCO	12	56	2-29
broadpetal strawberry	FRVI	2	62	1-5
western hawkweed	HIAL2	2	62	1-8
yarrow	ACMIL	3	81	1-10
woods strawberry	FRVE	6	25	2-12

ENVIRONMENT
LOCATION: Central, south
ELEVATION: 4300-5850 ft. (5122 ft.)
ASPECT: All aspects
SLOPE: 1-20% (8%)
TERRAIN FEATURES: Ridgetop, upper, middle, or lower 1/3 of slope on all surfaces in steep, rolling to undulating, or flat terrain.
SOIL DEPTH: 12-48 in. (29 in.)
ASH DEPTH: 12-30 in. (21 in.)
SURFACE SOIL TEXTURES: sandy loam, silt loam
SUBSURFACE SOIL TEXTURES: sandy loam, silt loam, silty clay loam, clay
COARSE FRAGMENTS: 6-64% (28%)
PARENT MATERIAL: Residuum and colluvium of igneous, sedimentary, and metamorphic rocks, most with a mantle of ash or loess.

UTILIZATION RESPONSE
D - CAGE
IP - CARU, CARO, CACO, PONE
IU - LUCA, ARCO, FRVI, ACMIL
INV - VIAM

STAND AND OVERSTORY ATTRIBUTES (n = 10)
HERBAGE PRODUCTION (LBS/ACRE AIR DRY): 131-609 (421)
TOTAL BASAL AREA (SQ FT/ACRE): 60-258 (163)
TREE CANOPY COVERAGE (%): 20-81 (47)
STAND GBA (SQ FT/ACRE): 90-191 (138)

SPECIES	NO. PLOTS	BASAL AREA	AGE	SITE INDEX	GBA	PROD. INDEX
PIPO	10	160/41	227/52	71/4	141/21	41/8

Veg. Composition: Ponderosa pine is climax. Juniper and Douglas-fir may be associated at low coverages. Shrub composition is minor. Common snowberry (SYAL) may occur incidentally. Pinegrass (CARU) and elk sedge (CAGE) are the dominant herbs in late seral stands. Forbs common to this type are white hawkweed (HIAL), broadpetal strawberry (FRVI), heartleaf arnica (ARCO), and tailcup lupine (LUCA).

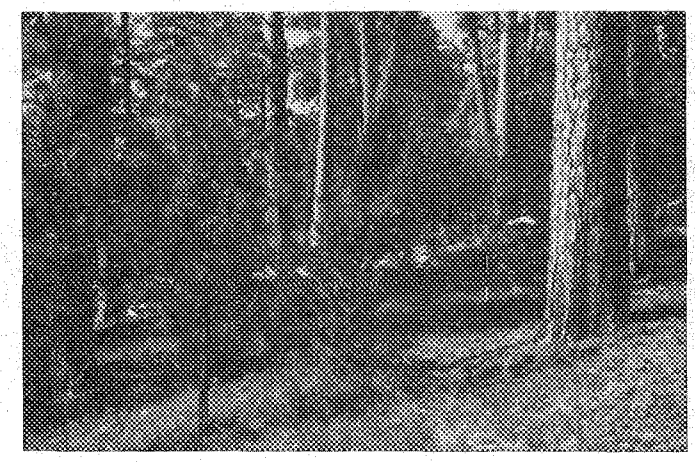
Typal Comparisons: PIPO/CARU communities principally occur in the central and southern Blue and Ochoco Mountains at mid and upper elevations. It occupies gentle to moderate slopes at all slope positions. Soils contain an ash cap over varied substrates. Soils of PIPO/CARU communities retain more moisture than those of PIPO/CAGE plant communities. Sites are moderately productive for PIPO.

Successional Relationships: Pinegrass (CARU) is promoted by fire and has high fidelity with ash soils. Pinemat manzanita (ARNE) and ceanothus (CEVE) pioneer after fire. Forbs which increase with disturbed undergrowth are vetch (VIAM), bigleaf sandwort (ARMA3), strawberries, tailcup lupine (LUCA), yarrow (ACMIL), and heartleaf arnica (ARCO).

Management Considerations: Competition from CARU-CAGE with regeneration of pine seedlings is high. Mistletoe infestations may be serious. Ungulate use is high (CAGE used early; CARU used late season); deer and elk use is high in spring. Both CARU and CAGE are resistant to fire. Ponderosa pine seedling establishment is enhanced by underburning.

Relationship to Other Studies: The PIPO/CARU plant association has not been described previously. Hall (1973) incorporated this vegetation in "Mixed Conifer - pinegrass."

Ponderosa pine/elk sedge plant association
Pinus ponderosa/Carex geyeri
PIPO/CAGE (CPG2 22)



Dugout Creek (Proposed RNA) (Prairie City RD, Malheur NF)

Table of Principal Species (n = 17)

Species	Code	Mean Cov (%)	Cons. (%)	Range
ponderosa pine	PIPO	39	100	15-74
Douglas-fir	PSME	3	47	1-8
western juniper	JUOC	4	47	1-15
common snowberry	SYAL	2	64	1-5
creeping Oregon-grape	BERE	2	70	1-7
bitterbrush	PUTR	2	41	1-3
elk sedge	CAGE	32	100	10-60
pinegrass	CARU	3	35	1-5
Idaho fescue	FEID	25	35	15-40
Wheeler's bluegrass	PONE	4	70	1-20
bluebunch wheatgrass	AGSP	13	41	1-40
bottlebrush squirreltail	SIHY	2	35	1-2
prairie junegrass	KOCR	5	47	1-20
tailcup lupine	LUCA	4	41	2-10
western hawkweed	HIAL2	1	52	1-3
yarrow	ACMIL	2	76	1-7
broadpetal strawberry	FRVI	2	41	1-7

ENVIRONMENT
LOCATION: Central, south
ELEVATION: 3350-5800 ft. (4918 ft.)
ASPECT: All aspects
SLOPE: 2-50% (14%)
TERRAIN FEATURES: Ridgetop, upper, middle, or lower 1/3 of slope on all surfaces in steep, rolling to undulating or flat terrain.
SOIL DEPTH: 18-38 in. (26 in.)
ASH DEPTH:
SURFACE SOIL TEXTURES: sandy loam, silt, clay loam
SUBSURFACE SOIL TEXTURES: sandy loam, silt, silty clay loam, clay loam, clay
COARSE FRAGMENTS: 5-61% (37%)
PARENT MATERIAL: Residuum and colluvium of igneous, sedimentary, or metamorphic rocks.

UTILIZATION RESPONSE
D - CAGE, FEID, AGSP
IP - CARU, PONE, KOCR, SIHY
IU - LUCA, ACMIL, FRVI
INV - -

STAND AND OVERSTORY ATTRIBUTES (n = 17)
HERBAGE PRODUCTION (LBS/ACRE AIR DRY): 250-800 (393)
TOTAL BASAL AREA (SQ FT/ACRE): 35-174 (90)
TREE CANOPY COVERAGE (%): 18-82 (42)
STAND GBA (SQ FT/ACRE): 29-147 (78)

SPECIES	NO. PLOTS	BASAL AREA	AGE	SITE INDEX	GBA	PROD. INDEX
PIPO	17	86/18	188/38	70/5	77/18	24/7

Veg. Composition: Ponderosa pine is climax. Juniper and Douglas-fir are often associated at low coverages. Shrub coverages are low with common snowberry (SYAL) and Oregon-grape (BERE) frequently associated. Elk sedge (CAGE) is always present. Grasses are abundant in this type with Wheeler's bluegrass (PONE), bluebunch wheatgrass (AGSP), Idaho fescue (FEID) and prairie junegrass (KOCR) often occurring. Forbs are minor components.

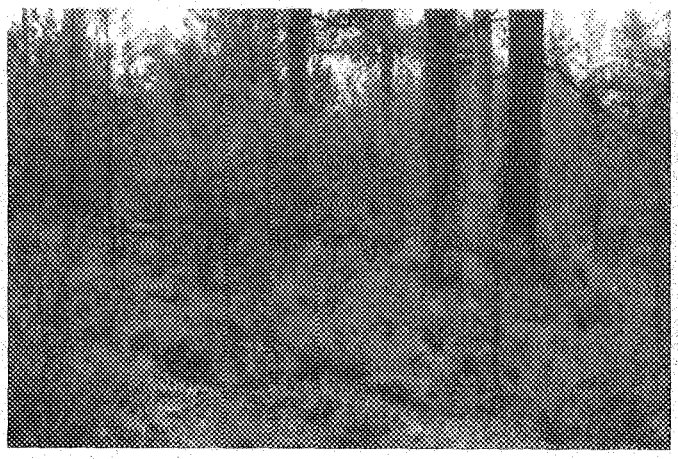
Typal Comparisons: PIPO/CAGE plant communities occur principally in the central and southern Blue and Ochoco Mountains at mid elevations. They occur on all slope positions and on gentle to steep topography. Soils are moderate to deep over varied substrates. Ash influence on soil characteristics is minor or absent. PIPO/CAGE communities are warmer and drier than PIPO/CARU communities. Sites have moderate overstory production for the PIPO series, similar to other types with CAGE or PUTR in the understories.

Successional Relationships: The elk sedge-dominance over pinegrass occurs on soils relatively free of ash. In early seral stands, the bunchgrasses (FEID, AGSP, KOCR), tailcup lupine (LUCA), heartleaf arnica (ARCO) and yarrow (ACMIL) may be more prominent.

Management Considerations: Moisture competition between elk sedge and pine seedlings may be severe. Droughtiness of this type enhances effects of dwarf mistletoe on pine and juniper. Uneven-aged management of pine appropriate on non-infested sites. Ungulate use often high (elk sedge is used early in season). CAGE resists fire and develops rapidly following fire. Pine seedling establishment is enhanced by underburning.

Relationship to Other Studies: The PIPO/CAGE plant association has not been previously described. Hall (1973) incorporated this vegetation in "Mixed Conifer - pinegrass."

Ponderosa pine/bitterbrush/Ross' sedge plant association
Pinus ponderosa/Purshia tridentata/Carex rossii
PIPO/PUTR/CARO (CPS2 21)



Emigrant Creek Canyon (Snow Mountain RD, Ochoco NF)

Table of Principal Species (n = 7)

Species	Code	Mean Cov (%)	Cons. (%)	Range
ponderosa pine	PIPO	42	100	24-53
western juniper	JUOC	2	42	1-4
bitterbrush	PUTR	14	100	2-36
creeping Oregon-grape	BERE	2	57	1-2
Ross' sedge	CARO	10	100	3-15
western needlegrass	STOC	1	100	1-2
prairie junegrass	KOCR	1	85	1-2
bottlebrush squirreltail	SIHY	4	100	1-10
bluebunch wheatgrass	AGSP	2	42	1-2
Idaho fescue	FEID	1	42	1-2
Wheeler's bluegrass	PONE	4	71	1-14
Sandberg's bluegrass	POSA3	2	85	1-4
yarrow	ACMIL	1	100	1-2
broadpetal strawberry	FRVI	1	42	1-1
narrowleaf pussytoes	ANST	2	71	1-3
eriophyllum	ERLA	2	57	2-2

ENVIRONMENT
LOCATION: South
ELEVATION: 4800-5400 ft. (5083 ft.)
ASPECT: Southerly exposures
SLOPE: 1-25% (5%)
TERRAIN FEATURES: Ridgetop, upper, middle 1/3 of slope on flat surfaces in steep, rolling to undulating, or flat terrain.
SOIL DEPTH: 10-24 in. (17 in.)
ASH DEPTH:
SURFACE SOIL TEXTURES: sandy loam, loam
SUBSURFACE SOIL TEXTURES: sandy loam, loam, silt loam, silty clay loam
COARSE FRAGMENTS: 14-60% (33%)
PARENT MATERIAL: Residuum and colluvium of rhyolitic rocks with loess.

UTILIZATION RESPONSE
D - PUTR, FEID, AGSP
IP - CARO, KOCR, PONE, POSA3
IU - STOC, SIHY, ACMIL, FRVI, ERLA
INV - CHVI, CHNA

STAND AND OVERSTORY ATTRIBUTES (n = 7)
HERBAGE PRODUCTION (LBS/ACRE AIR DRY): 170-260 (194)
TOTAL BASAL AREA (SQ FT/ACRE): 75-160 (111)
TREE CANOPY COVERAGE (%): 25-57 (43)
STAND GBA (SQ FT/ACRE): 53-154 (90)

SPECIES	NO. PLOTS	BASAL AREA	AGE	SITE INDEX	GBA	PROD. INDEX
PIPO	7	111/31	177/50	67/8	90/34	28/16

Veg. Composition: The PIPO/PUTR/CARO community occupies the warm, moist end of the environmental gradient between the three PIPO/PUTR types. Ponderosa pine and juniper are the only tree species these sites can support. Bitterbrush dominates; Oregon-grape (BERE) is usually present. Grasses and sedges constitute the dominant species of the herbaceous vegetation. Ross' sedge (CARO) usually dominates. Bluegrasses (PONE, POSA3), bottlebrush squirreltail (SIHY), western needlegrass (STOC) and prairie junegrass (KOCR) frequently occur. Narrowleaf pussytoes (ANST) and eriophyllum (ERLA) are the most frequently occurring forbs.

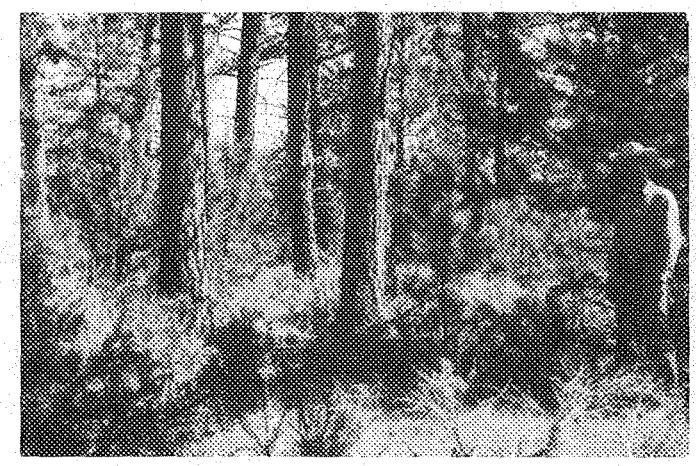
Typal Comparisons: PIPO/PUTR/CARO is prominent in the Ochoco and southern Blue Mountains occurring on shallow soils of rhyolitic flows and tuffs. It was found at moderate montane elevations on gentle to moderate slopes at ridgetop to mid slope positions. PIPO/PUTR/CARO has the highest PI and GBA with the lowest herb production of the three PIPO/PUTR types. This association has moderate overstory productivity for the PIPO series, similar to PIPO/CAGE, PIPO/CELE/CAGE, and PIPO/PUTR/CAGE.

Successional Relationships: Fire and grazing are principal modifiers of this vegetation. Fire retards bitterbrush but promotes pine and bunchgrasses. Overgrazing may encourage dominance by rabbitbrushes (CHVI, CHNA), yarrow (ACMIL), bottlebrush squirreltail (SIHY), and tailcup lupine (LUCA).

Management Considerations: Uneven-aged management of pine will sustain open forest character. Mistletoe may be common. Ungulate use is high (especially deer). Key winter range - high nutritional value of PUTR. Ross' sedge is not promoted by fire as readily as CAGE and CARU, but will be retained in the community. Seedling establishment of pine is promoted by fire. Tree seedling competition with CARO is moderate. Overuse by ungulates reduces PUTR seedlings and ability for shrub recruitment. This type is one of the lowest herbage producing plant communities of the ponderosa pine series.

Relationship to Other Studies: Hall (1973) was the first to describe the PIPO/PUTR/CARO plant association. It appears to be endemic to the Ochoco and Southern Malheur National Forest landscape.

Ponderosa pine/bitterbrush/elk sedge plant association
Pinus ponderosa/Purshia tridentata/Carex geyeri
PIPO/PUTR/CAGE (CPS2 22)



Emigrant Creek Canyon (Snow Mountain RD, Ochoco NF)

Table of Principal Species (n = 6)

Species	Code	Mean Cov (%)	Cons. (%)	Range
ponderosa pine	PIPO	42	100	25-60
bitterbrush	PUTR	13	100	5-20
creeping Oregon-grape	BERE	2	100	1-3
mountain-mahogany	CELE	4	50	1-7
common snowberry	SYAL	3	50	2-3
snowbrush ceanothus	CEVE	2	50	1-3
elk sedge	CAGE	37	100	13-60
bottlebrush squirreltail	SIHY	1	50	1-1
Ross' sedge	CARO	1	66	1-1
yarrow	ACMIL	2	83	1-3
western hawkweed	HIAL2	2	50	1-2
tailcup lupine	LUCA	3	50	2-3
narrowleaf pussytoes	ANST	1	50	1-1

ENVIRONMENT
LOCATION: Central, south
ELEVATION: 4400-5600 ft. (4975 ft.)
ASPECT: Principally southerly exposures
SLOPE: 3-50% (19%)
TERRAIN FEATURES: Upper or middle 1/3 of slope on all surfaces in steep, rough to rolling or undulating terrain.
SOIL DEPTH: 18-24 in. (23 in.)
ASH DEPTH:
SURFACE SOIL TEXTURES: sandy loam, loam
SUBSURFACE SOIL TEXTURES: sandy loam, loam, silt loam
COARSE FRAGMENTS: 33-61% (45%)
PARENT MATERIAL: Residuum and colluvium of igneous, sedimentary, and metamorphic rocks.

UTILIZATION RESPONSE
D - PUTR, CELE, CAGE
IP - SYAL, CARO, HIAL2
IU - CEVE, SIHY, ACMIL, LUCA
INV - -

STAND AND OVERSTORY ATTRIBUTES (n = 6)
HERBAGE PRODUCTION (LBS/ACRE AIR DRY): 100-450 (324)
TOTAL BASAL AREA (SQ FT/ACRE): 50-120 (89)
TREE CANOPY COVERAGE (%): 25-60 (43)
STAND GBA (SQ FT/ACRE): 48-103 (73)

SPECIES	NO. PLOTS	BASAL AREA	AGE	SITE INDEX	GBA	PROD. INDEX
PIPO	6	89/27	209/40	64/7	73/25	20/8

Veg. Composition: Sites supporting this type are intermediate between PIPO/PUTR/CARO and PIPO/PUTR/FEID in th environmental gradient of warm, moist and warm, dry. Ponderosa pine, bitterbrush and elk sedge each dominate th life form layers. Oregon-grape (BERE), mountain-mahogany (CELE) and common snowberry (SYAL) are usuall present. Ponderosa pine is the only tree species these sites can support.

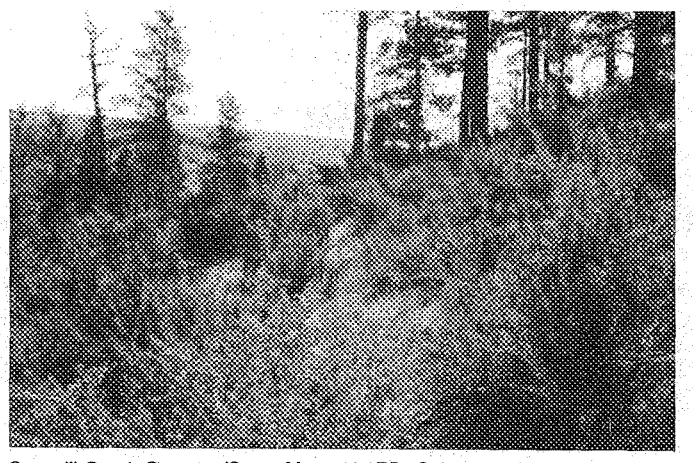
Typal Comparisons: PIPO/PUTR/CAGE occurs in the central and southern Blue and Ochoco Mountains at moderat elevations. Soils are shallow to moderately deep over varied substrates. These communities were found on moderat to steep slopes at upper and mid slope positions. This association has moderate overstory productivity for the PIP(series, similar to PIPO/PUTR/CARO, PIPO/CAGE, and PIPO/CELE/CAGE.

Successional Relationships: Fire promotes ceanothus (CEVE). Bitterbrush (PUTR) and mountain-mahogany (CELE readily succumb to fire. Overgrazing or surface disturbance may promote arrowleaf balsamroot (BASA), eriophyllu (ERLA), tailcup lupine (LUCA), yarrow (ACMIL), and bottlebrush squirreltail (SIHY).

Management Considerations: Multiple-age classes favor the varied resource values inherent in stands of this plar association. Mistletoes may be common. Ungulate use is high (especially by deer). PIPO/PUTR/CAGE is a key winte range community. Bitterbrush has high nutritional value. Tree seedling competition with CAGE is severe. Elk sedge promoted and rapidly colonizes following surface fires. Limit the disturbance by fire for retention of bitterbrush. Over-us by ungulates jeopardizes PUTR seedlings and shrub recruitment.

Relationship to Other Studies: This plant association has not been previously described.

Ponderosa pine/bitterbrush/Idaho fescue-bluebunch wheatgrass plant association
Pinus ponderosa/Purshia tridentata/Festuca idahoensis - Agropyron spicatum
PIPO/PUTR/FEID-AGSP (CPS2 26)



Sawmill Creek Canyon (Snow Mountain RD, Ochoco NF)

Table of Principal Species (n = 3)

Species	Code	Mean Cov (%)	Cons. (%)	Range
ponderosa pine	PIPO	30	100	12-41
western juniper	JUOC	2	66	1-3
bitterbrush	PUTR	12	100	5-21
green rabbitbrush	CHVI	1	66	1-1
creeping Oregon-grape	BERE	1	66	1-1
Idaho fescue	FEID	22	100	3-40
bluebunch wheatgrass	AGSP	18	66	4-31
Wheeler's bluegrass	PONE	4	66	1-6
Sandberg's bluegrass	POSA3	1	66	1-1
bottlebrush squirreltail	SIHY	1	66	1-1
prairie junegrass	KOCR	2	66	1-2
yarrow	ACMIL	2	100	1-3
Eaton's fleabane	EREA	5	66	1-8
rosy pussytoes	ANRO	2	66	1-3

ENVIRONMENT
LOCATION: Central, south
ELEVATION: 4000-5100 ft. (4600 ft.)
ASPECT: All aspects
SLOPE: 3-30% (21%)
TERRAIN FEATURES: Ridgetop, upper, or middle 1/3 of slope on all surfaces in steep, rolling to undulating terrain.
SOIL DEPTH: 22-32 in. (27 in.)
ASH DEPTH:
SURFACE SOIL TEXTURES: Sandy loam, loam, silt loam
SUBSURFACE SOIL TEXTURES: Sandy loam, silt loam, silty clay loam
COARSE FRAGMENTS: 23-74% (49%)
PARENT MATERIAL: Residuum and colluvium of rhyolitic rocks, some with loess.

UTILIZATION RESPONSE
D - PUTR, FEID, AGSP
IP - POSA3, KOCR, PONE
IU - SIHY, ACMIL
INV - CHVI

STAND AND OVERSTORY ATTRIBUTES (n = 3)
HERBAGE PRODUCTION (LBS/ACRE AIR DRY): 292-545 (426)
TOTAL BASAL AREA (SQ FT/ACRE): 47-175 (102)
TREE CANOPY COVERAGE (%): 15-42 (31)
STAND GBA (SQ FT/ACRE): 36-115 (67)

SPECIES	NO. PLOTS	BASAL AREA	AGE	SITE INDEX	GBA	PROD. INDEX
PIPO	3	102/163	254/9	65/13	67/105	18/29

Veg. Composition: Ponderosa pine forms an open forest with western juniper over a shrub layer dominated b bitterbrush. Oregon-grape (BERE) is usually associated. Bunchgrasses prominently occupy the ground surface; sedge are absent. Idaho fescue (FEID) and bluebunch wheatgrass (AGSP) are the most abundant grasses; bluegrasse (PONE, POSA3) and prairie junegrass (KOCR) are usually present.

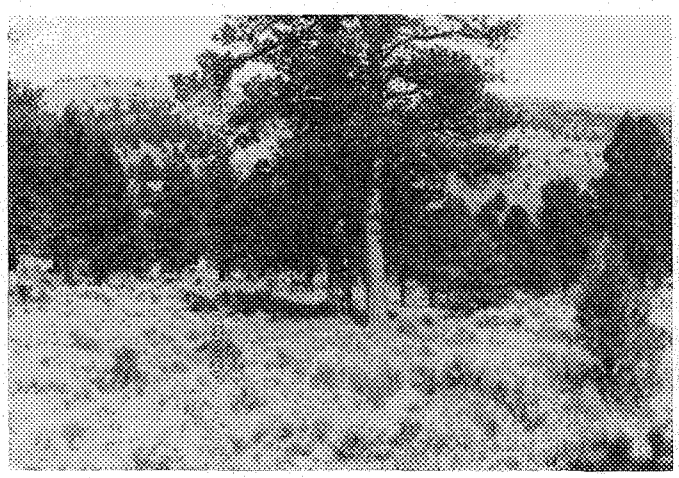
Typal Comparisons: PIPO/PUTR/FEID-AGSP occurs at moderate elevation in the central and southern Blue an Ochoco Mountains on gentle to moderate slopes from ridgetop to mid slope positions. It is the warmest and driest the PIPO/PUTR types.

Successional Relationships: Disturbed communities may contain rabbitbrushes (CHVI, CHNA), yarrow (ACMIL bottlebrush squirreltail (SIHY), needlegrasses (STIPA), and lupines. Fire stimulates and sustains the bunchgrasses b may be detrimental to the bitterbrush stand.

Management Considerations: Uneven-aged management will sustain open forest character of stands in this type. Tre seedling competition with bunchgrasses is minimal. Mistletoes may be common. Fire enhances bunchgrass vegetatio but, fire is injurious to bitterbrush if soils are dry and seed can not sprout. PIPO/PUTR/FEID-AGSP communities are valuable part of deer winter range; bitterbrush is high in nutritional value. Ungulate overuse severly hedges PUTR plant retards recruitment of juvenile plants and jeopardizes future bitterbrush composition.

Relationship to Other Studies: This is a widespread plant association which has been classified by Daubenmire (196 in eastern Washington; Pfister (1977) in Montana; Steele (1981) in central Idaho; Clausnitzer and Zamora (1987) northern Washington; Volland (1976) and Hopkins (1979) in central Oregon. This is the first description for easte Oregon.

Ponderosa pine/mountain big sagebrush/Idaho fescue-bluebunch wheatgrass plant association
Pinus ponderosa/Artemisia tridentata vaseyana/Festuca idahoensis-Agropyron spicatum
PIPO/ARTRV/FEID-AGSP (CPS1 31)



Alkali Creek (Burns RD, Malheur NF)

Table of Principal Species (n = 6)

Species	Code	Mean Cov (%)	Cons. (%)	Range
ponderosa pine	PIPO	17	100	10-25
western juniper	JUOC	6	83	1-18
mountain big sagebrush	ARTRV	19	100	10-30
bitterbrush	PUTR	6	50	3-10
squaw currant	RICE	4	50	1-6
gray rabbitbrush	CHVI	3	66	1-5
Idaho fescue	FEID	9	100	2-25
bluebunch wheatgrass	AGSP	7	83	1-15
Sandberg's bluegrass	POSA3	11	83	5-20
yarrow	ACMIL	3	66	1-5
western groundsel	SEIN	3	83	1-8
narrowleaf pussytoes	ANST	2	66	2-2
creamy buckwheat	ERHE	1	66	1-2
phlox	PHLOX	2	50	1-3

ENVIRONMENT
LOCATION: South
ELEVATION: 4500-5550 ft. (5026 ft.)
ASPECT: All aspects
SLOPE: 3-40% (22%)
TERRAIN FEATURES: Ridgetop, upper, middle, or lower 1/3 of slope on all surfaces in steep, rolling, undulating, or flat terrain.
SOIL DEPTH:
ASH DEPTH:
SURFACE SOIL TEXTURES:
SUBSURFACE SOIL TEXTURES:
COARSE FRAGMENTS:
PARENT MATERIAL: Residuum and colluvium of igneous, sedimentary, or metamorphic rocks.

UTILIZATION RESPONSE
D - PUTR, FEID, AGSP
IP - POSA3
IU - ARTRV, ACMIL, ERHE, PHLOX, SEIN
INV - CHVI, CHNA, ANNUAL BROMES

STAND AND OVERSTORY ATTRIBUTES (n = 5)
HERBAGE PRODUCTION (LBS/ACRE AIR DRY): 225-450 (354)
TOTAL BASAL AREA (SQ FT/ACRE): 16-56 (36)
TREE CANOPY COVERAGE (%): 10-31 (22)
STAND GBA (SQ FT/ACRE): 40-107 (74)

SPECIES	NO. PLOTS	BASAL AREA	AGE	SITE INDEX	GBA	PROD. INDEX
PIPO	5	30/23	81/102	81/13	81/34	29/16

Veg. Composition: A forest savannah comprised of ponderosa pine, western juniper, and mountain big sagebrush (ARTRV). Bitterbrush (PUTR), squaw currant (RICE) and mountain-mahogany (CELE) may also be present. Bunchgrasses dominate the herbaceous vegetation (FEID, AGSP, POSA3). Western grounsel (SEIN) is the most commonly occurring forb.

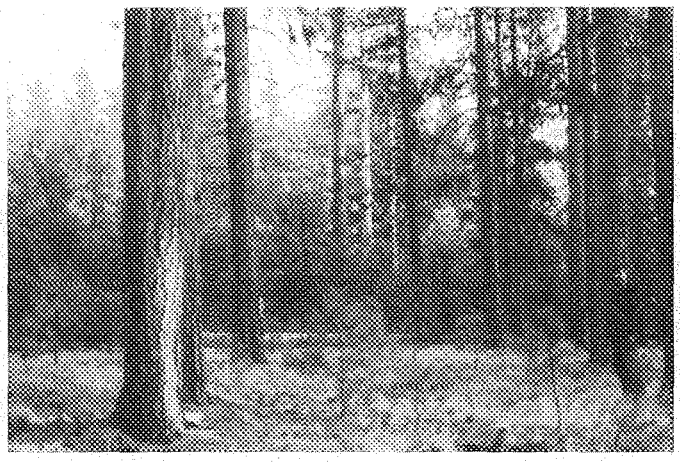
Typal Comparisons: PIPO/ARTRV/FEID-AGSP occurs at mid elevations in the southern Blue and Ochoco Mountains on gentle to moderate slopes on ridgetop and all slope positions. Sites exhibit moderate productivity for PIPO, similar to PIPO/CELE/CAGE and PIPO/PUTR types.

Successional Relationships: Fire favors pine and bunchgrasses; it also tends to reduce juniper, bitterbrush, mountain mahogany, and mountain big sagebrush. Disturbance may increase rabbitbrushes, yarrow (ACMIL), creamy buckwheat (ERHE), phlox, annual bromes, penstemons, and lupines.

Management Considerations: The open pine-shrub-grass mosaic is best retained by individual tree selection or light spotty burning. Hot burns are injurious to the varied shrub composition. These communities are important for wildlife utilization and landscape and species diversity. Ungulate use can readily degrade these communities from overgrazing and trampling (compaction). Rabbitbrush and forb-rich compositions result.

Relationship to Other Studies: Volland (1976) classified a PIPO/PUTR-ARTRV/FEID plant association in the central Oregon pumice zone. This is similar floristically to the PIPO/ARTRV/FEID-AGSP of the Blue-Ochoco Mountains.

Ponderosa pine/Idaho fescue plant association
Pinus ponderosa/Festuca idahoensis
PIPO/FEID (CPG1 12)



Elliott Creek (Big Summit RD, Ochoco NF)

Table of Principal Species (n = 16)

Species	Code	Mean Cov (%)	Cons. (%)	Range
ponderosa pine	PIPO	29	100	7-47
western juniper	JUOC	7	62	1-33
bitterbrush	PUTR	1	62	1-4
creeping Oregon-grape	BERE	2	43	1-3
mountain-mahogany	CELE	3	37	1-4
Idaho fescue	FEID	29	100	15-60
bluebunch wheatgrass	AGSP	9	75	2-31
Sandberg's bluegrass	POSA3	4	56	1-15
elk sedge	CAGE	4	50	2-6
Wheeler's bluegrass	PONE	5	43	1-9
bottlebrush squirreltail	SIHY	2	56	1-4
Ross' sedge	CARO	2	43	1-4
prairie junegrass	KOCR	2	43	1-4
yarrow	ACMIL	3	93	1-7
western hawkweed	HIAL2	2	43	1-3
tailcup lupine	LUCA	4	37	1-20
red avens	GETR	3	37	1-8
hot rock penstemon	PEDE	1	31	1-2

ENVIRONMENT
LOCATION: North, central, south
ELEVATION: 3800-5300 ft. (4636 ft.)
ASPECT: Principally southerly exposures
SLOPE: 1-80% (18%)
TERRAIN FEATURES: Ridgetop, upper, middle, or lower 1/3 of slope on all surfaces in steep, rough to rolling or undulating terrain.
SOIL DEPTH: 12-50 in. (28 in.)
ASH DEPTH:
SURFACE SOIL TEXTURES: sandy loam, loam, silt loam
SUBSURFACE SOIL TEXTURES: sandy loam, loam, silt loam, clay loam, silty clay
COARSE FRAGMENTS: 6-54% (31%)
PARENT MATERIAL: Residuum and colluvium of igneous, sedimentary, and metamorphic rocks; some with loess.

UTILIZATION RESPONSE
D - FEID, AGSP
IP - POSA3, KOCR, HIAL
IU - PONE, SIHY, ACMIL, LUCA, GETR
INV - ANNUAL BROMES

STAND AND OVERSTORY ATTRIBUTES (n = 15)
HERBAGE PRODUCTION (LBS/ACRE AIR DRY): 250-497 (362)
TOTAL BASAL AREA (SQ FT/ACRE): 25-196 (81)
TREE CANOPY COVERAGE (%): 9-60 (33)
STAND GBA (SQ FT/ACRE): 25-146 (69)

SPECIES	NO. PLOTS	BASAL AREA	AGE	SITE INDEX	GBA	PROD. INDEX
PIPO	15	79/28	196/34	62/5	68/19	18/6

Veg. Composition: Ponderosa pine forms an open, park-like savannah with bunchgrass vegetation. Western junipe and ponderosa pine are the only tree species these warm, dry sites can support. Bitterbrush is often present at lov coverage. Idaho fescue (FEID) is the dominant herbaceous species in late seral communities. Other bunchgrasse usually present are bluebunch wheatgrass (AGSP), Sandberg's bluegrass (POSA3) and bottlebrush squirreltail (SIHY) Yarrow (ACMIL) is the most common forb.

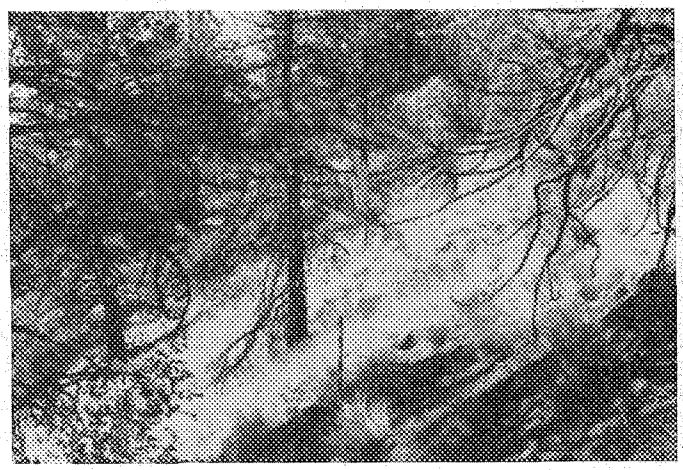
Typal Comparisons: PIPO/FEID communities occur at low to mid elevations in the Blue and Ochoco Mountains. Th type occurred on gentle to steep slopes at all positions. They were found on moderate to deep soils overlying a geologic substrates. Sites supporting this plant association are more mesic than FEID/AGSP sites; PIPO/FEID site occupy slightly cooler sites with greater moisture retention capability. Water holding capacity was 50% greater o sampled PIPO/FEID sites than on the PIPO/AGSP sites. This association has low productivity for PIPO, similar to othe types with bunchgrass understories.

Successional Relationships: Periodic fire helps provide vitality to the grassland, stimulates grass vigor and provide seedbed opportunities for pine regeneration. Disturbed sites may show increases by yarrow (ACMIL), lupines, red aven (GETR), penstemons, clovers, phlox, and annual bromes.

Management Considerations: This association may be unsuited as commercial timber producing communities be cause of regeneration difficulties and low productivities. Uneven-aged management results in retention of valuable olde age classes. Prescribed burns can promote the bunchgrasses, improve pine establishment and control stocking. Site are important to elk and deer in providing spring and early summer forage.

Relationship to Other Studies: PIPO/FEID was described in eastern Washington by Daubenmire (1968); in the Blu Mountains by Hall (1973); in Montana by Pfister, et al (1977); in central Idaho by Steele (1981); in north Idaho by Coope et al (1987); in northern Washington by Clausnitzer and Zamora (1987); and in the Wallowas and Seven Devils b Johnson and Simon (1987).

Ponderosa pine/bluebunch wheatgrass plant association
Pinus ponderosa/Agropyron spicatum
PIPO/AGSP (CPG1 11)



Tucannon River Canyon (Pomeroy RD, Umatilla NF)

Table of Principal Species (n = 12)

Species	Code	Mean Cov (%)	Cons. (%)	Range
ponderosa pine	PIPO	20	100	7-40
western juniper	JUOC	3	41	1-7
common snowberry	SYAL	3	41	1-7
bitterbrush	PUTR	2	33	1-3
serviceberry	AMAL	3	25	2-5
bluebunch wheatgrass	AGSP	30	100	8-60
Idaho fescue	FEID	4	66	1-7
elk sedge	CAGE	5	50	2-7
Sandberg's bluegrass	POSA3	6	83	1-20
bottlebrush squirreltail	SIHY	2	25	1-2
yarrow	ACMIL	4	75	1-15
western hawkweed	HIAL2	1	41	1-3
creamy buckwheat	ERHE	1	41	1-3
arrowleaf balsamroot	BASA	2	25	1-3
desert parsleys	LOMAT	3	33	1-7
tailcup lupine	LUCA	10	33	1-20

ENVIRONMENT
LOCATION: North, central, south
ELEVATION: 2175-5400 ft. (4323 ft.)
ASPECT: Southerly aspects
SLOPE: 4-100% (32%)
TERRAIN FEATURES: Ridgetop, upper, middle, or lower 1/3 of slope on all surfaces in steep, rough to rolling, or undulating terrain.
SOIL DEPTH: 8-42 in. (21 in.)
ASH DEPTH:
SURFACE SOIL TEXTURES: sandy loam, loam, silt loam
SUBSURFACE SOIL TEXTURES: sandy loam, loam, silt loam, clay loam
COARSE FRAGMENTS: 10-50% (35%)
PARENT MATERIAL: Residuum and colluvium of igneous, sedimentary, and metamorphic rocks with loess.

UTILIZATION RESPONSE
D - AGSP, FEID, CAGE, PUTR
IP - POSA3, SYAL, HIAL2, BASA
IU - SIHY, ACMIL, ERHE
INV - ASTRA, APAN, ANNUAL BROMES

STAND AND OVERSTORY ATTRIBUTES (n = 11)
HERBAGE PRODUCTION (LBS/ACRE AIR DRY): 200-750 (381)
TOTAL BASAL AREA (SQ FT/ACRE): 15-113 (43)
TREE CANOPY COVERAGE (%): 8-40 (22)
STAND GBA (SQ FT/ACRE): 15-176 (45)

SPECIES	NO. PLOTS	BASAL AREA	AGE	SITE INDEX	GBA	PROD. INDEX
PIPO	11	42/17	109/46	59/10	45/32	13/12

Veg. Composition: Ponderosa pine forms an open, park-like savannah with bunchgrass vegetation. Western juniper and ponderosa pine are the only tree species these warm, dry sites can support. Shrubs are infrequent. Bluebunch wheatgrass (AGSP) is the dominant herbaceous species in late seral communities in good ecologic condition. Other bunchgrasses usually occurring are Idaho fescue (FEID) and Sandberg's bluegrass (POSA3). Yarrow (ACMIL) is the most common forb.

Typal Comparisons: PIPO/AGSP plant communities occur at low to mid elevations in the Blue and Ochoco Mountains. They were found on gentle to steep slopes and all topographic positions. Soils were shallow to deep overlying various substrates. PIPO/AGSP is considered drier than PIPO/FEID (waterholding capacity of sampled PIPO/FEID sites were 50% higher). This association has low productivity for PIPO, similar to other types with bunchgrass understories.

Successional Relationships: Periodic fire helps provide vitality to the grassland, stimulates grass vigor and provides regenerative opportunities for the pine. Disturbed sites may show increases by yarrow (ACMIL), lupines, clovers, milkvetches (ASTRA), dogbane (APAN), phlox and annual bromes.

Management Considerations: Usually unsuited for timber production due to severity of sites to adequately regenerate. Uneven-aged management may be used to promote vigorous regeneration and maintain the diverse, open stand character. Ungulate use is high because older pines shelter animals and forage is readily available. Underburning can influence density of pine, maintain grassland vigor and prepare seedbeds for pine establishment. Fires may not carry uniformly in these open grassy stands.

Relationship to Other Studies: PIPO/AGSP was described in eastern Washington by Daubenmire (1968); in the Blue Mountains by Hall (1973); in Montana by Pfister, et al (1977); in central Idaho by Steele (1981); in north Idaho by Cooper, et al (1987); in northern Washington by Clausnitzer and Zamora (1987); and in the Wallowas and Seven Devils by Johnson and Simon (1987).

Ponderosa pine/mountain big sagebrush/elk sedge plant communities
Pinus ponderosa/Artemisia tridentata vaseyana/Carex geyeri
PIPO/ARTRV/CAGE (n = 2) (CPS1)

This community forms a pine savannah over a shrub-herb mosaic of mountain big sagebrush (ARTRV), bitterbrush (PUTR), elk sedge (CAGE), prairie junegrass (KOCR) and tailcup lupine (LUCA). Western juniper may be present. Other shrubs often occurring are snowberries, roses, and currants. When disturbed these communities may have higher coverages by rabbitbrushes, annual bromes, penstemons, creamy buckwheat (ERHE), tailcup lupine (LUCA), and yarrow (ACMIL).

Sampled communities were in the central and southern Blue Mountains at mid elevations on gentle and moderate slopes. These open forest communities are promoted by cool underburning, selective harvest and uneven-aged clump management. Hot burns can alter these communities by eradication of ARTRV. Elk sedge, junegrass and forbs (especially lupine and creamy buckwheat) are stimulated and promoted by burning. Value to wildlife and grazing animals is high for the diversity of plants comprising these communities.

Ponderosa pine/squawapple plant communities
Pinus ponderosa/Peraphyllum ramosissimum
PIPO/PERA3 (n = 2) (CPS1)

PIPO/PERA3 was found in the central Blue Mountains at low montane elevations on gentle to steep slopes at lower slope positions. These are transitional communities which contain a rich variety of shrub species. Ponderosa pine and western juniper are the only tree species occurring as an open forest or savannah above the shrub-dominated understory. Squawapple (PERA3), squaw currant (RICE) and bitterbrush (PUTR) are the prominent shrubs. Elk sedge (CAGE) is the dominant herbaceous species associated with the type. Bluebunch wheatgrass (AGSP), Idaho fescue (FEID), and creamy buckwheat (ERHE) occur from the overlapping adjacent bunchgrass communities. This community often occurs as a fringe between ponderosa pine/bunchgrass communities and sagebrush steppe. The ecologic factors controlling the distribution of squawapple are unknown. The species has a relatively restricted and sporadic occurrence in northeastern Oregon.

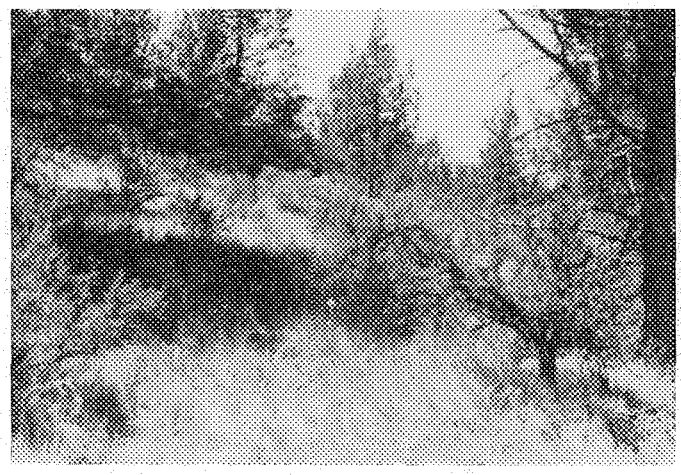
Ponderosa pine/low sagebrush plant communities
Pinus ponderosa/Artemisia arbuscula
PIPO/ARAR (n = 1) (CPS1)

Plant communities depicting the gradual ecotones (or transitions) between low sagebrush/bunchgrass communities and ponderosa pine/bunchgrass communities occur in the southern Blue and Ochoco Mountains. Western juniper may be present with ponderosa pine. Low sagebrush dominates. Bunchgrasses associated may be Idaho fescue (FEID), bluebunch wheatgrass (AGSP), Sandberg's bluegrass (POSA3) and prairie junegrass (KOCR). Disturbed ground surface may be populated by bighead clover (TRMA), bisquitroots (LOMAT), and creamy buckwheat (ERHE).

Ponderosa pine/smooth sumac plant communities
Pinus ponderosa/Rhus glabra
PIPO/RHGL (n = 1)

The PIPO/RHGL is a plant community occurring in canyons of the northern Blue Mountains. Here ponderosa pine forms a savannah with warm, dry site shrubs on a steep rocky talus toe slope. Smooth sumac (RHGL), syringa (PHLE2), oceanspray (HODI), spiraea (SPBE), cherries and roses constitute the primary shrubs. Adjacent communities may be FEID-AGSP grasslands and Douglas-fir/oceanspray or ponderosa pine/Idaho fescue forestlands. Other commonly occurring plants are mountain brome (BRCA), tailcup lupine (LUCA) and Wheeler's bluegrass (PONE). These stands are not suitable for timber production, however, they are valuable as an element in landscape biodiversity with its attendant wildlife attributes.

Western juniper/bitterbrush/Idaho fescue-bluebunch wheatgrass plant association
Juniperus occidentalis/Purshia tridentata/Festuca idahoensis-Agropyron spicatum
JUOC/PUTR/FEID-AGSP (CJS3 21)



Skookum 3-way Exclosure (Heppner RD, Umatilla NF)

Table of Principal Species (n = 4)

Species	Code	Mean Cov (%)	Cons. (%)	Range
western juniper	JUOC	11	100	10-13
bitterbrush	PUTR	18	100	15-20
low sagebrush	ARAR	7	50	5-8
mountain big sagebrush	ARTRV	2	50	1-2
Idaho fescue	FEID	25	100	15-35
bluebunch wheatgrass	AGSP	8	100	1-25
Sandberg's bluegrass	POSA3	10	100	3-20
bottlebrush squirreltail	SIHY	1	25	1-1
yarrow	ACMIL	25	100	15-35
bisquitroots	LOMAT	1	75	1-1
phlox	PHLOX	3	75	2-5
low pussytoes	ANDI	1	50	1-1
pale agoseris	AGGL	1	50	1-1
red avens	GETR	1	50	1-1
yellow salsify	TRDU	1	50	1-1
western groundsel	SEIN	1	50	1-1

ENVIRONMENT
LOCATION: Central, south
ELEVATION: 3760-4825 ft. (4334 ft.)
ASPECT: All aspects
SLOPE: 5-15% (11%)
TERRAIN FEATURES: Ridgetop and upper 1/3 of slope on flat or convex surfaces in steep, rolling to rolling, or undulating, or flat terrain.
SOIL DEPTH:
ASH DEPTH:
SURFACE SOIL TEXTURES:
SUBSURFACE SOIL TEXTURES:
COARSE FRAGMENTS:
PARENT MATERIAL: Residuum and colluvium of igneous and sedimentary rocks with ash and loess.

STAND AND OVERSTORY ATTRIBUTES (n=4)
HERBAGE PRODUCTION (LBS/ACRE AIR DRY): 300-425 (358)
TOTAL BASAL AREA (SQ FT/ACRE): (30)
TREE CANOPY COVERAGE (%): 10-15 (12)

SOIL SURFACE CHARACTERISTICS

ELEMENT	% COVER	RANGE
ROCK	4	1-5
PAVEMENT	10	10
BAREGROUND	24	5-50
MOSS	3	1-5

UTILIZATION RESPONSE

D - FEID, AGSP, PUTR
IP - POSA3
IU - ARTRV, ACMIL, PHLOX
INV - TRDU

Veg. Composition: A diverse juniper savannah with a shrub-grass-forb mosaic. Bitterbrush is often joined by low sagebrush (ARAR) on moderate soils, and mountain big sagebrush (ARTRV) on deeper soils. All three principal bunchgrasses (FEID, AGSP, POSA3) occur in late seral stage. Forbs usually occurring are yarrow (ACMIL), bisquitroots and phlox.

Typal Comparisons: The JUOC/PUTR/FEID-AGSP plant association occurs in the central and southern Blue and Ochoco Mountains at low to mid elevations on gentle to moderate slopes at ridgetop and upper slope positions. Sites are on varied substrates.

Successional Relationships: Juniper can not tolerate fire. Animal use is the principal cause of retrogression to earlier seral stages. Shading of animals beneath trees may replace fescue with cheatgrass and other annual vegetation. Heavy browsing by deer and domestic animals may reduce the bitterbrush composition and affect PUTR establishment of juvenile plants. Forbs replacing the bunchgrasses in early seral stands are red avens (GETR), tailcup lupine (LUCA), phlox, creamy buckwheat (ERHE) and yarrow (ACMIL).

Management Considerations: Readily used by cattle and big game for shading; bedding by deer. Early season use by livestock can reduce vitality of the grassland. The bitterbrush sagebrush-bunchgrass mix provides high quality wildlife habitat. These communities occur in principal deer winter range areas. Promotion of species diversity and retention of shrubs with grasses is desirable. Fire can readily be employed to reduce "off site" juniper. Use of fire "on site" would reduce juniper and bitterbrush to detriment of the plant community.

Relationship to Other Studies: A JUOC/PUTR/FEID-AGSP plant association was described by Volland (1988) in the central Oregon pumice area.

Western juniper/Idaho fescue-bluebunch wheatgrass plant association
Juniperus occidentalis/Festuca idahoensis - Agropyron spicatum
JUOC/FEID-AGSP (CJG1 11)

Shaketable (Proposed RNA) (Bear Valley RD, Malheur NF)

Table of Principal Species (n = 7)

Species	Code	Mean Cov (%)	Cons. (%)	Range
western juniper	JUOC	18	100	8-40
ponderosa pine	PIPO	2	57	1-5
bitterbrush	PUTR	2	28	1-3
bluebunch wheatgrass	AGSP	15	100	3-30
Idaho fescue	FEID	26	85	5-50
Sandberg's bluegrass	POSA3	5	85	3-10
prairie junegrass	KOCR	4	42	3-5
onespike oatgrass	DAUN	7	42	3-10
cheatgrass	BRTE	5	42	1-10
yarrow	ACMIL	3	85	1-10
bisquitroots	LOMAT	1	57	1-2
arrowleaf balsamroot	BASA	4	57	2-5
tailcup lupine	LUCA	4	57	1-10

ENVIRONMENT
LOCATION: Central, south
ELEVATION: 3050-5850 ft. (4644 ft.)
ASPECT: All aspects
SLOPE: 5-70% (29%)
TERRAIN FEATURES: Ridgetop, upper, or middle 1/3 of slope on flat or convex surfaces in steep, rough to rolling, undulating, or flat terrain.
SOIL DEPTH:
ASH DEPTH:
SURFACE SOIL TEXTURES:
SUBSURFACE SOIL TEXTURES:
COARSE FRAGMENTS:
PARENT MATERIAL: Residuum and colluvium of igneous, sedimentary, and metamorphic rocks.

STAND AND OVERSTORY ATTRIBUTES (n=6)
HERBAGE PRODUCTION (LBS/ACRE AIR DRY): 260-700 (442)
TOTAL BASAL AREA (SQ FT/ACRE): (20)
TREE CANOPY COVERAGE (%): 10-40 (19)

SOIL SURFACE CHARACTERISTICS

ELEMENT	% COVER	RANGE
ROCK	36	20-65
PAVEMENT	10	10
BAREGROUND	13	3-20
MOSS	11	1-25

UTILIZATION RESPONSE

D - FEID, AGSP
IP - POSA3, KOCR, DAUN
IU - ACMIL, LUCA, GETR
INV - BRTE

Veg. Composition: Western juniper forms a savannah with bunchgrasses. Ponderosa pine and bitterbrush may be present as incidental species. The three principal bunchgrasses (FEID, AGSP, POSA3) dominate the herb cover in late seral stands. Yarrow (ACMIL), arrowleaf balsamroot (BASA) and tailcup lupine (LUCA) are usually present.

Typal Comparisons: The highest herbage producer of the juniper plant associations. This type occurs in the central and southern Blue Mountains at low to high elevations on moderate to steep slopes from ridgetops to mid slope positions. Sites are on varied rocky substrates.

Successional Relationships: Fire is injurious to juniper. Shading animals degrade tree understories and cause greatest impact on succession of the associated grasses. With degradation, Idaho fescue (FEID) beneath trees is replaced by cheatgrass (BRTE). Forbs replacing bunchgrasses in early seral stands are red avens (GETR), fleabanes, tailcup lupine (LUCA), phlox, creamy buckwheat (ERHE) and yarrow.

Management Considerations: Sites are readily used by cattle and big game for shading; bedding by deer. Chukars, quail, and grouse also use these communities. Fire can be employed to reduce juniper. Juniper is valuable for wildlife, watershed, and landscape diversity values.

Relationship to Other Studies: Hall (1973) described "juniper/bunchgrass" in the Blue Mountains; Johnson and Simon described JUOC/FEID-AGSP in the Wallowa-Snake of northeast Oregon.

Western juniper/mountain-mahogany/elk sedge communities
Juniperus occidentalis/Cercocarpus ledifolius/Carex geyeri
JUOC/CELE/CAGE (n = 2) (CJS4)

Western juniper forms a savannah with ponderosa pine over mountain-mahogany (CELE) and elk sedge (CAGE). Grasses are usually associated due to the proximity of grasslands. Principal bunchgrasses are bluebunch wheatgrass (AGSP), Sandberg's bluegrass (POSA3), and prairie junegrass (KOCR). These communities are often transitional between deep soil bunchgrass-dominated vegetation and ponderosa pine forests. Increasing with disturbance are yarrow (ACMIL), arrowleaf balsamroot (BASA) and annual bromes.

This is the highest elevation juniper community (mean = 5400 ft.). It occurs in the central and southern Blue and Ochoco Mountains on gentle to steep slopes at moderate soil depths and on varying substrates.

The western juniper/mountain-mahogany savannah is important for wildlife "edge" providing a variety of cover and food. The juxtaposition of these communities is important to overall landscape and species diversity. Fire may severely damage these communities owing to the susceptibility of JUOC and CELE to mortality from burning. The limited occurrence by these communities enhances their value for retention as important for wildlife and biodiversity.

Western juniper/mountain-mahogany/Idaho fescue-bluebunch wheatgrass communities
Juniperus occidentalis/Cercocarpus ledifolius/Festuca idahoensis-Agropyron spicatum
JUOC/CELE/FEID-AGSP (n = 2) (CJS4)

Western juniper forms a savannah (often with ponderosa pine) over mountain-mahogany (CELE) and the three principal bunchgrasses (FEID, AGSP, POSA3). The communities are often transitional between deeper soil bunchgrass - dominated vegetation and ponderosa pine forests. Increasing with disturbance are yarrow (ACMIL), creamy buckwheat (ERHE), needlegrass (STOC) and annual bromes.

These juniper communities were found at mid elevations in the central and southern Blue and Ochoco Mountains on steep slopes, shallow soils and rhyolitic substrates. Productivity of herbaceous vegetation was similar to JUOC/CELE/CAGE.

The western juniper/mountain-mahogany savannah is important for wildlife "edge" providing a variety of cover and food. The juxtaposition of these communities is important to overall landscape and species diversity. Fire may severely damage these communities owing to the susceptibility of JUOC and CELE to mortality from burning. The limited occurrence by these communities enhances their value for retention as important for wildlife and biodiversity.

Western juniper/Mountain big sagebrush communities
Juniperus occidentalis/Artemisia tridentata
JUOC/ARTRV/FEID-AGSP (CJS2)

This plant community forms a mosaic with scattered western juniper among mountain big sagebrush and bunchgrasses. The prominent bunchgrasses are bluebunch wheatgrass (AGSP), Idaho fescue (FEID), and Sandberg's bluegrass (POSA3). With overgrazing prairie junegrass (KOCR), bottlebrush squirreltail (SIHY), and western needlegrass (STOC) tend to increase. Cheatgrass (BRTE) will dominate with severe site degradation.

Western juniper/low sagebrush plant communities
Juniperus occidentalis/Artemisia arbuscula
JUOC/ARAR (n = 1) (CJS1)

Western juniper forms a savannah over a low sagebrush (ARAR) community. Associated are the three princip bunchgrasses (FEID, AGSP, POSA3). Forbs which may occur are yarrow (ACMIL), bisquitroots (LOMAT), and dagge pod (PHCH). These communities are often adjacent to low sagebrush/Idaho fescue - bluebunch wheatgrass (ARAI FEID-AGSP) communities or low sagebrush/Sandberg's bluegrass (ARAR/POSA3) communities.

The JUOC/ARAR communities occur in the central and southern Blue and Ochoco Mountains at mid montane elev tions. Slopes are gentle over moderately deep soils.

Juniper affords shading to animals using the vegetation adjacent to these communities, or the associated sagebrus bunchgrass community. Grazing animals utilize the bunchgrass; browsing animals use the sagebrush leaders. Th JUOC/ARAR savannah has high value to domestic livestock and wildlife.

Western juniper/stiff sagebrush plant communities
Juniperus occidentalis/Artemisia rigida
JUOC/ARRI (n = 2) (CJS8)

Western juniper forms a scabland savannah over gentle topography dominated by grasses and stiff sagebrush (ARF in good ecologic condition. Principal grasses are bluebunch wheatgrass (AGSP), onespike oatgrass (DAUN), San berg's bluegrass (POSA3), and dwarf squirreltail (SIHYH). Forbs frequently occurring are narrowleaf stonecrop (SELA2 bighead clover (TRMA), false agoseris (MITR) and low pussytoes (ANDI). These communities often are ecotonal betwee ARRI/POSA3 scablands and ponderosa pine forests.

Juniper/stiff sagebrush communities occur in the central and southern Blue and Ochoco Mountains on gentle slopes mid montane elevations. Sites are rocky; soils are shallow over fractured scabland basalt and andesite. Sampled plo contained the lowest herbage production of any juniper communities (mean = 175 lb/Acre).

Juniper affords shading to animals using these communities or adjacent non-forested communities. Stiff sagebrush valuable to browsing animals and to grouse, sparrows, and other birds utilizing seeds from associated grass and forb Heavy use may cause hedging of stiff sage and possible mortality. Frost heaving and soil erosion are accelerated fro heavy trafficking and trampling damage.

Ninebark - common snowberry plant association
Physocarpus malvaceus - Symphoricarpos albus
PHMA-SYAL (SM11 11)

Umatilla River Canyon (Umatilla Indian Reservation)

Table of Principal Species (n = 5)

Species	Code	Mean Cov (%)	Cons. (%)	Range
ponderosa pine	PIPO	3	40	1-5
Douglas-fir	PSME	1	40	1-1
ninebark	PHMA	51	100	20-80
common snowberry	SYAL	16	100	3-40
serviceberry	AMAL	3	100	1-7
oceanspray	HODI	17	80	1-40
spiraea	SPBE	10	80	1-20
Rocky Mtn. maple	ACGL	2	60	1-3
roses	ROSA	7	60	3-10
cherries	PRUNU	22	40	3-40
syringa	PHLE2	2	40	1-2
Scouler willow	SASC	4	40	1-7
bluebunch wheatgrass	AGSP	11	100	1-40
elk sedge	CAGE	8	60	1-20
yarrow	ACMIL	2	60	1-3
red avens	GETR	1	40	1-1
bedstraw	GALIU	1	40	1-1

ENVIRONMENT
LOCATION: North
ELEVATION: 1750-4775 ft. (2635 ft.)
ASPECT: All aspects
SLOPE: 55-120% (83%)
TERRAIN FEATURES: Upper, middle, or lower 1/3 of slope on all surfaces in steep, rough terrain.
SOIL DEPTH: 8-48 in. (32 in.)
ASH DEPTH:
SURFACE SOIL TEXTURES: loam, silt loam
SUBSURFACE SOIL TEXTURES: loam, silt loam
COARSE FRAGMENTS: 40-50% (45%)
PARENT MATERIAL: Residuum and colluvium of basalt, some mixed with ash and loess.

PRODUCTION (n = 5)
HERBAGE PRODUCTION (LBS/ACRE AIR DRY): 40-351 (213)
TOTAL BASAL AREA (SQ FT/ACRE):

SOIL SURFACE CHARACTERISTICS

ELEMENT	% COVER	RANGE
ROCK	7	-
PAVEMENT	-	-
BAREGROUND	2	-
MOSS	32	10-60

UTILIZATION RESPONSE

D - AGSP, CAGE
IP - SYAL, HODI, PHMA
IU - ACMIL, SPBE
INV - GAAP, ANNUAL BROMES

Veg. Composition: The PHMA-SYAL shrubland may be the result of stand replacement fire in PSME/PHMA communities or may be the result of severe competition imposed by ninebark to thwart tree establishment. The PHMA-SYAL shrubland may contain ponderosa pine and/or Douglas-fir trees at low coverage. Ninebark (PHMA), common snowberry (SYAL), oceanspray (HODI), spiraea (SPBE), and serviceberry (AMAL) are the most common shrubs of the community type. Roses, cherries, Rocky Mtn. maple (ACGL), and syringa (PHLE2) are often present. Beneath the shrubs, herbaceous growth is restricted. Elk sedge (CAGE) and bluebunch wheatgrass (AGSP) occur from adjacent communities.

Typal Communities: Ninebark-snowberry shrublands occur primarily in the northern Blue Mountains on steep canyor slopes at upper, mid, and lower slope positions. Soils are deep loess and ash over basalt. Sampled elevations rangec from 1750 to 4775 ft. (mean = 2635 ft.).

Successional Relationships: Fire periodically consumes PHMA-SYAL shrublands. Most of the associated shrut species resprout basally following fire, quickly returning the shrubland to vigorous growth. Cyclic fire events may help discourage tree establishment. Initial pioneering plants following fire are varileaf phacelia (PHHE), fireweed (EPAN) anc annual bromes. Rocky Mtn. maple presence indicates a moist phase of this type.

Management Considerations: Principal use is for big game cover and livestock shading. These communities provide wildlife habitat and add diversity to the canyon landscape. Silvicultural activity may be cost ineffective based on the intense shrub competition and difficulty of access. Value to watershed for slope stability and water quality is high.

Relationship to Other Studies: Hall (1973) described PHMA-SYAL shrublands in the Blue Mountains; Johnson anc Simon (1987) described PHMA-SYAL in the Wallowa-Snake of northeastern Oregon.

Mountain-mahogany/Idaho fescue-bluebunch wheatgrass plant association
Cercocarpus ledifolius/Festuca idahoensis - Agropyron spicatum
CELE/FEID-AGSP (SD41 11)

Dugout Creek (Proposed RNA) (Prairie City RD, Malheur NF)

Table of Principal Species (n = 4)

Species	Code	Mean Cov (%)	Cons. (%)	Range
ponderosa pine	PIPO	2	75	1-3
mountain-mahogany	CELE	34	100	10-60
snowberry	SYAL, SYOR	3	75	2-3
bluebunch wheatgrass	AGSP	18	100	7-40
Idaho fescue	*FEID*	12	50	4-20
Sandberg's bluegrass	POSA3	3	75	3-4
prairie junegrass	KOCR	6	50	5-7
elk sedge	CAGE	4	50	1-7
western needlegrass	STOC	3	50	3-3
Wheeler's bluegrass	PONE	21	75	1-60
mountain brome	BRCA	1	50	1-1
yarrow	ACMIL	3	75	3-4
creamy buckwheat	ERHE	2	75	1-3
lanceleaved stonecrop	SELA2	8	50	5-10
hawksbeard	CREPI	1	50	1-1

ENVIRONMENT
LOCATION: North, central, south
ELEVATION: 4520-6050 ft. (5025 ft.)
ASPECT: Southerly exposures
SLOPE: 10-80% (41%)
TERRAIN FEATURES: Upper 1/3 of slope on all surfaces in steep, rough to rolling terrain.
SOIL DEPTH: 9-42 in. (21 in.)
ASH DEPTH:
SURFACE SOIL TEXTURES: sandy loam, loam, silt loam
SUBSURFACE SOIL TEXTURES: loam, silt loam, silty clay loam
COARSE FRAGMENTS: 50-65% (55%)
PARENT MATERIAL: Residuum and colluvium of igneous, sedimentary, and metamorphic rocks.

PRODUCTION (n = 4)
HERBAGE PRODUCTION (LBS/ACRE AIR DRY): 220-570 (363)
TOTAL BASAL AREA (SQ FT/ACRE):

SOIL SURFACE CHARACTERISTICS

ELEMENT	% COVER	RANGE
ROCK	15	7-20
PAVEMENT	6	3-9
BAREGROUND	8	3-14
MOSS	2	-

UTILIZATION RESPONSE

D - FEID, AGSP, CELE
IP - POSA3, KOCR, POPR, PONE
IU - STOC, ERHE, ACMIL
INV - ANNUAL BROMES

Veg. Composition: These are mountain-mahogany-dominated shrublands with a grassy undergrowth dominated by bunchgrass vegetation. Either common or mountain snowberry (SYAL, SYOR) may be associated with the mahogany. Principal bunchgrasses are Idaho fescue (FEID), bluebunch wheatgrass (AGSP), Sandberg's bluegrass (POSA3), Wheeler's bluegrass (PONE), and prairie junegrass (KOCR). Principal forbs are yarrow (ACMIL) and creamy buckwheat (ERHE).

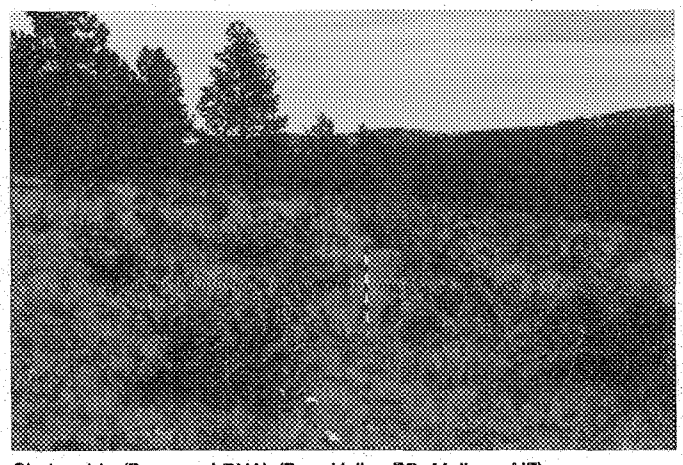
Typal Comparisons: These communities are found throughout the Blue-Ochoco Mountains at mid to upper montane locations on gentle to steep slopes. Soils are shallow and stony overlying varied substrates including basalts and rhyolitic tuffs. CELE/CAGE was found at higher mountainous locations on andesite.

Successional Relationships: Mountain-mahogany readily succumbs to fire. Fire promotes bunchgrass vegetation. Overgrazed communities may show increases by Wheeler's bluegrass (PONE), Kentucky bluegrass (POPR), annual bromes, western needlegrass (STOC), creamy buckwheat (ERHE), and yarrow (ACMIL). Browsing animals may influence the ability of juvenile mountain-mahogany plants to establish.

Management Considerations: Mountain-mahogany foliage is highly preferred by big game species. Dense thickets provide excellent winter cover and browse for big game. Stands are valuable as providers of diversity to the Blue-Ochoco Mountains landscape.

Relationship to Other Studies: CELE/FEID-AGSP has not been previously described. Schlatterer (1972) described CELE-SYOR-ARTRV/FEID-AGSP communities in central Idaho; Mueggler and Stewart (1980) described a CELE/AGSP habitat type in Montana. Hall (1973) included CELE/FEID-AGSP in a "mountain-mahogany-grass" plant community type in the Blue Mountains. Johnson and Simon (1987) described three mountain-mahogany plant community types in the Snake River canyon without specifying bunchgrasses.

Bitterbrush/Idaho fescue - bluebunch wheatgrass plant association
Purshia tridentata/Festuca idahoensis-Agropyron spicatum
PUTR/FEID-AGSP (SD31 11)



Shaketable (Proposed RNA) (Bear Valley RD, Malheur NF)

Table of Principal Species (n = 3)

Species	Code	Mean Cov (%)	Cons. (%)	Range
western juniper	JUOC	2	66	1-2
ponderosa pine	PIPO	4	66	3-4
bitterbrush	PUTR	13	100	8-20
mountain mahogany	CELE	3	66	2-3
Idaho fescue	FEID	7	100	1-15
bluebunch wheatgrass	AGSP	22	100	10-30
Sandberg's bluegrass	POSA3	14	100	12-15
prairie junegrass	KOCR	2	66	1-3
onespike oatgrass	DAUN	7	66	3-10
bottlebrush squirreltail	SIHY	2	66	1-2
yarrow	ACMIL	5	100	4-6
phlox	PHLOX	2	66	1-2
rosy pussytoes	ANRO	2	66	1-3
fleabane	ERIGE	5	66	3-6
sandwort	ARENA	2	66	1-3

ENVIRONMENT
LOCATION: Central, South
ELEVATION: 4600-5400 ft. (4900 ft.)
ASPECT: Southerly exposures
SLOPE: 3-10% (8%)
TERRAIN FEATURES: Ridgetop, upper, middle, or lower 1/3 of slope on all surfaces in undulating or flat terrain.
SOIL DEPTH: 24-26 in. (25 in.)
ASH DEPTH:
SURFACE SOIL TEXTURES: Sandy loam, loam
SUBSURFACE SOIL TEXTURES: Clay loam
COARSE FRAGMENTS: 21%
PARENT MATERIAL: Residuum and colluvium of igneous, sedimentary, and metamorphic rock.

PRODUCTION (n = 3)
HERBAGE PRODUCTION (LBS/ACRE AIR DRY):

SOIL SURFACE CHARACTERISTICS

ELEMENT	% COVER	RANGE
ROCK	7	5-10
PAVEMENT	15	-
BAREGROUND	12	3-20
MOSS	3	-

UTILIZATION RESPONSE:

D - PUTR, FEID, AGSP
PI - POSA3, KOCR, DAUN
UI - SIHY, ACMIL
INV - ANNUAL BROMES

Veg. Composition: The PUTR/FEID-AGSP shrubland is often transitional to PIPO/PUTR/FEID-AGSP stands, to scab lands, or grasslands on ridgetops. Ponderosa pine and western juniper often occur at low coverages. Bitterbrush is th dominant shrub; mountain-mahogany may occur. The three primary bunchgrasses (FEID, AGSP, POSA3) dominate th herbaceous layer in late seral stage vegetation. Prominent forbs are yarrow (ACMIL), rosy pussytoes (ANRO), fleabanes and phlox.

Typal Comparisons: Sampled communities of PUTR/FEID-AGSP occurred at mid montane elevations in the Southern Blue and Ochoco Mountains. Sites were on gentle slopes at all slope positions. Soils were moderately deep over shyolit (tuff and flows), similar to PIPO/PUTR/FEID-AGSP which occurred on more varied substrates, coarser soils, and steepe slopes. Productivity of herbaceous vegetation was higher in PIPO/PUTR/FEID-AGSP (426 vs 373 lb/Ac.).

Successional Relationships: Degenerated communities (often from overgrazing) will show decreases in FEID, AGSP possible increases by POSA3, DAUN. Heavily impacted sites may show declines in bitterbrush. Increasing in very earl seral stages is bottlebrush squirreltail (SIHY), annual bromes, annual forbs, and locoweeds (ASTRA).

Management Considerations: Bitterbrush readily succumbs to fire. Regeneration of bitterbrush communities can b accomplished using fire, but only with wet soil at time of burn and shortly thereafter to facilitate seedling germinatio and establishment. These communities are highly desirable to wildlife, especially for winter-spring range. Achenes c bitterbrush are important foods for chipmunks, mice and mantled ground squirrels. Passerines use the fruits as wel Upland game birds use fruits and buds. Mule deer are principal users of bitterbrush in all seasons but especially fc winter diets. Cattle and sheep use is principally in later summer and early fall.

Relationship to Other Studies: Daubenmire (1970) defined PUTR/FEID h.t. in the Cascadian foothills of Washingtor Hall (1973) classified "bitterbrush/bunchgrass" in the southern Blue and Ochoco Mountain; Mueggler and Stewart (198C found PUTR/FEID to be scarce in Montana. Johnson and Simon (1987) described a PUTR/FEID-AGSP plant associatio in the Wallowa Mountains.

Mountain big sagebrush/elk sedge plant association
Artemisia tridentata vaseyana/Carex geyeri
ARTRV/CAGE (SS49 11)

Vinegar Hill (Proposed RNA) (Long Creek RD, Malheur NF)

Table of Principal Species (n = 13)

Species	Code	Mean Cov (%)	Cons. (%)	Range
mountain big sagebrush	ARTRV	18	100	1-40
mountain snowberry	SYOR	2	38	1-3
elk sedge	CAGE	40	100	15-70
western needlegrass	STOC	4	69	1-20
mountain brome	BRCA	3	38	1-8
yarrow	ACMIL	2	92	1-3
western hawkweed	HIAL2	4	84	1-7
golden buckwheat	ERFL	4	76	1-7
phlox	PHLOX	14	38	4-20
sandwort	ARENA	7	46	1-20

ENVIRONMENT
LOCATION: North, central, south
ELEVATION: 5090-8150 ft. (6861 ft.)
ASPECT: Southerly exposures
SLOPE: 4-80% (32%)
TERRAIN FEATURES: Ridgetop, upper, or middle 1/3 of slope on all surfaces in steep, rough to rolling terrain.
SOIL DEPTH: 10-36 in. (24 in.)
ASH DEPTH:
SURFACE SOIL TEXTURES: sandy loam, loam, silt loam
SUBSURFACE SOIL TEXTURES: sandy loam, loam, silt loam, clay loam
COARSE FRAGMENTS: 25-70% (49%)
PARENT MATERIAL: Residuum and colluvium of igneous, sedimentary, and metamorphic rocks.

PRODUCTION (n = 13)
HERBAGE PRODUCTION (LBS/ACRE AIR DRY): 50-450 (304)
TOTAL BASAL AREA (SQ FT/ACRE):

SOIL SURFACE CHARACTERISTICS

ELEMENT	% COVER	RANGE
ROCK	8	1-20
PAVEMENT	19	3-60
BAREGROUND	10	1-25
MOSS	1	-

UTILIZATION RESPONSE:

D - CAGE
PI - BRCA
UI - STOC, ERFL, PHLOX, SIHY, ARTRV
INV - POPH, LUPIN

Veg. Composition: These high elevation mountain big sagebrush communities contain elk sedge (CAGE) beneath the shrubs as the dominant herbaceous plant. Yarrow (ACMIL), western hawkweed (HIAL2) and golden buckwheat (ERFL) are usually associated.

Typal Comparisons: A high elevation (mean = 7027 ft.) plant community found throughout the Blue-Ochoco Mountains on gentle to steep mountain ridges and slopes. Soils are moderately deep and stony over basalt. ARTRV/FEID-AGSP communities occur at lower elevations (mean = 5000 ft.) on deep, stony soils over various geologic substrates. Herbage production is similar for both ARTRV plant associations.

Successional Relationships: Mountain big sagebrush succumbs readily to fire. Elk sedge is resistant to fire. Disturbance from overgrazing has resulted in loss of elk sedge prominence. Increases in mountain brome (BRCA), western needlegrass (STOC), golden buckwheat (ERFL), phlox, bottlebrush squirreltail (SIHY), lupines and fleeceflower (POPH) result from degradation of ARTRV/CAGE sites.

Management Considerations: Although known to sprout following fire, cool burns with moist soils are required to enable the sagebrush to retain its density when burned. Fires of later summer and early fall are injurious to mountain big sagebrush. Value to wildlife is high. Used by grouse, ground squirrels and passerines.

Relationship to Other Studies: Hall (1973) incorporated ARTRV/CAGE in the "alpine sagebrush" plant community type of the Blue Mountains. Johnson and Simon (1987) described a similar ARTRV/CAGE plant community type in the Seven Devils of Idaho.

Mountain big sagebrush/Idaho fescue-bluebunch wheatgrass plant association
Artemisia tridentata vaseyana/Festuca idahoensis-Agropyron spicatum
ARTRV/FEID-AGSP (SD29 11)

Rattlesnake Ridge (Prairie City RD, Malheur NF)

Table of Principal Species (n = 15)

Species	Code	Mean Cov (%)	Cons. (%)	Range
western juniper	JUOC	2	46	1-7
mountain big sagebrush	ARTRV	16	100	5-60
green rabbitbrush	CHVI	1	86	1-3
bitterbrush	PUTR	2	60	1-6
Idaho fescue	FEID	21	93	1-38
bluebunch wheatgrass	AGSP	18	86	2-40
Sandberg's bluegrass	POSA3	11	86	7-16
prairie junegrass	KOCR	5	93	1-20
bottlebrush squirreltail	SIHY	2	80	1-10
western needlegrass	STOC	2	26	1-5
yarrow	ACMIL	2	86	1-5
creamy buckwheat	ERHE	4	93	1-25
phlox	PHLOX	4	66	1-12
tailcup lupine	LUCA	4	46	1-15
rosy pussytoes	ANRO	2	40	1-3
fleabanes	ERIGE	3	66	1-7
sulfur buckwheat	ERUM	1	40	1-3
hawksbeard	CREPI	1	60	1-2

ENVIRONMENT
LOCATION: Central, south
ELEVATION: 4525-5800 ft. (4951 ft.)
ASPECT: All aspects
SLOPE: 4-50% (17%)
TERRAIN FEATURES: Upper, middle or lower 1/3 of slope on all surfaces in steep, rough to rolling, or undulating terrain.
SOIL DEPTH: 16-56 in. (33 in.)
ASH DEPTH:
SURFACE SOIL TEXTURES: sandy loam, loam, silt loam
SUBSURFACE SOIL TEXTURES: sandy loam, loam, silt loam, silty clay loam, clay loam
COARSE FRAGMENTS: 15-66% (35%)
PARENT MATERIAL: Residuum and colluvium of igneous, sedimentary, and metamorphic rocks.

PRODUCTION (n = 15)
HERBAGE PRODUCTION (LBS/ACRE AIR DRY): 256-581 (376)
TOTAL BASAL AREA (SQ FT/ACRE):

SOIL SURFACE CHARACTERISTICS

ELEMENT	% COVER	RANGE
ROCK	5	1-17
PAVEMENT	10	1-29
BAREGROUND	14	3-30
MOSS	2	1-3

UTILIZATION RESPONSE

D - FEID, AGSP
IP - POSA3, BASA, KOCR
IU - SIHY, STOC, ACMIL, ERHE, LUCA, ARTRV
INV - CHVI, CHNA

Veg. Composition: Mountain big sagebrush forms open shrublands with bunchgrasses dominating beneath the shrubbery. Green rabbitbrush (CHVI) is often associated. Bunchgrasses commonly associated are Idaho fescue (FEID), bluebunch wheatgrass (AGSP), Sandberg's bluegrass (POSA3), and prairie junegrass (KOCR). The common forbs are creamy buckwheat (ERHE), phlox, yarrow (ACMIL), and fleabanes. Either bluebunch wheatgrass or Idaho fescue are present. Idaho fescue is indicative of more mesic conditions.

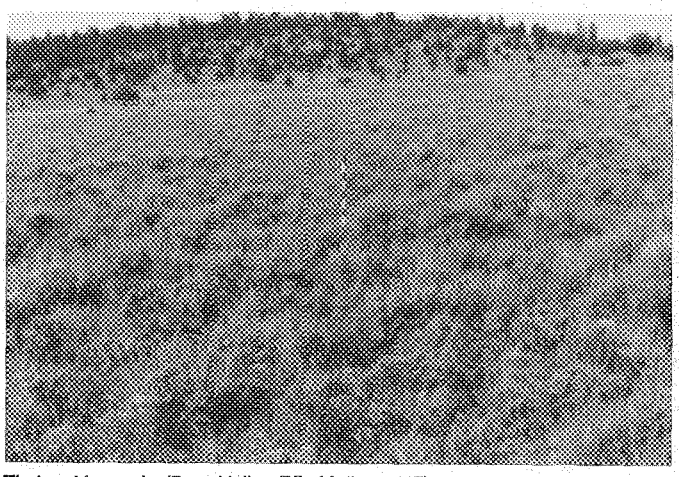
Typal Comparisons: Sampled communities were in the central and southern Blue and Ochoco Mountains on gentle to steep slopes at all positions. These lower montane communities (mean = 5000 ft.) occur on deep, stony soils over various substrates. Herbage production is similar to ARTRV/CAGE at higher elevations.

Successional Relationships: Mountain big sagebrush succumbs readily to fire. Bunchgrasses are invigorated by fire. Disturbance from grazing may decrease bunchgrass composition and increase rabbitbrushes. Grasses that increase with overgrazing are bottlebrush squirreltail (SIHY) and western needlegrass (STOC). Forbs that may become more prominent in earlier seral stages are yarrow (ACMIL), creamy buckwheat (ERHE), phlox, tailcup lupine (LUCA), fleabanes, arrowleaf balsamroot (BASA), penstemons, and indian paintbrushes.

Management Considerations: Fires of late summer are injurious to these communities. Cool burns, where soils are moist, enable the species to sprout following fire. Wildlife value is high. Passerines and ground squirrels are important users of these habitats. Valuable for watershed quality and as enhancing landscape diversity.

Relationship to Other Studies: Schlatterer (1972) described ARTRV/FEID and ARTRV/AGSP in south-central Idaho; Mueggler and Stewart (1980) described ARTRV/FEID and ARTRV/AGSP habitat types in Montana; Hall (1973) incorporated ARTRV/FEID and ARTRV/AGSP in the ARTRV/bunchgrass p.c.t. in the Blue Mountains; Johnson and Simon (1987) classified ARTRV/FEID in the Wallowa-Snake of northeast Oregon.

Low sagebrush/Idaho fescue-bluebunch wheatgrass plant association
Artemisia arbuscula/Festuca idahoensis-Agropyron spicatum
ARAR/FEID-AGSP (SD19 11)



Timber Mountain (Bear Valley RD, Malheur NF)

Table of Principal Species (n = 17)

Species	Code	Mean Cov (%)	Cons. (%)	Range
western juniper	JUOC	2	47	1-5
low sagebrush	ARAR	20	100	10-30
bitterbrush	PUTR	3	64	1-7
Idaho fescue	FEID	16	76	2-40
bluebunch wheatgrass	AGSP	17	76	1-33
Sandberg's bluegrass	POSA3	10	100	1-25
prairie junegrass	KOCR	1	52	1-2
onespike oatgrass	DAUN	2	47	1-5
bottlebrush squirreltail	SIHY	1	41	1-2
yarrow	ACMIL	2	52	1-4
phlox	PHLOX	5	70	1-15
bighead clover	TRMA	2	47	1-5
low pussytoes	ANDI	1	41	1-3
serrated balsamroot	BASE	1	41	1-2
scabland fleabane	ERBL	2	41	1-3
pale agoseris	AGGL	2	35	1-3
tapertip onion	ALAC	2	35	1-5
desert parsleys	LOMAT	2	52	1-7

ENVIRONMENT
LOCATION: Central, south
ELEVATION: 4300-6900 ft. (4997 ft.)
ASPECT: Principally southerly exposures
SLOPE: 1-40% (7%)
TERRAIN FEATURES: Ridgetop, upper, middle, or lower 1/3 of slope on flat or convex surfaces in steep, rough to rolling, or undulating terrain.
SOIL DEPTH: 9-27 in. (16 in.)
ASH DEPTH:
SURFACE SOIL TEXTURES: sandy loam, loam, silt loam, clay loam
SUBSURFACE SOIL TEXTURES: sandy loam, loam, silt loam, silty clay loam, clay loam, clay
COARSE FRAGMENTS: 5-70% (35%)
PARENT MATERIAL: Residuum and colluvium of igneous or metamorphic rocks with loess.

PRODUCTION (n = 17)
HERBAGE PRODUCTION (LBS/ACRE AIR DRY): 210-500 (365)
TOTAL BASAL AREA (SQ FT/ACRE):

SOIL SURFACE CHARACTERISTICS

ELEMENT	% COVER	RANGE
ROCK	12	1-22
PAVEMENT	15	4-45
BAREGROUND	17	4-60
MOSS	7	1-26

UTILIZATION RESPONSE

D - FEID, AGSP
IP - POSA3, KOCR, DAUN
IU - SIHY, ACMIL, PHLOX, TRMA
INV - ANNUAL BROMES

Veg. Composition: This is a low sagebrush community with dominance by bunchgrasses. Either Idaho fescue or bluebunch wheatgrass is present. Sandberg's bluegrass (POSA3) is always associated. Bitterbrush usually occurs. Common forb species are yarrow (ACMIL), phlox, bighead clover (TRMA), serrated balsamroot (BASE), low pussytoes (ANDI), and fleabanes. Western juniper is often present as an incidental species.

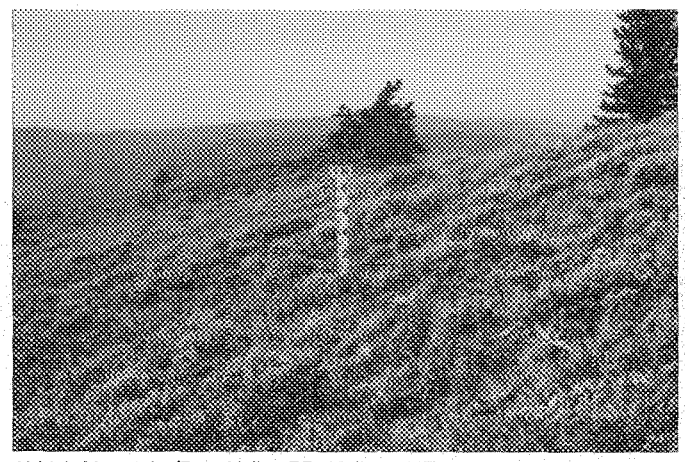
Typal Comparisons: Low to mid elevation ARAR/FEID-AGSP (mean = 5100 ft.) communities occur on gentle slopes in the central and southern Blue and Ochoco Mountains. Soils are shallow to moderately deep over various substrates. The ARAR/POSA3 plant community occurs over fractured basalt on scabland soils. Herbage production is about twice as high (332 vs 181 lbs/acre) in ARAR/FEID-AGSP communities. High elevation ARAR/FEID-AGSP occurs on south slopes of the Aldrich and Strawberry Ranges.

Successional Relationships: Grazing and browsing provides the primary inducement to vegetation change. Disturbance from grazing often provides increased coverage by yarrow (ACMIL), phlox, bighead clover (TRMA), serrated balsamroot (BASE), bottlebrush squirreltail (SIHY) and annual bromes.

Management Considerations: Low sagebrush plants are damaged by fire. Late summer and early fall burns may be detrimental to fescue. Bunchgrasses provide grazing for livestock and big game species. Sage grouse utilize these communities as principal habitats. Increased use of prescribed burning may decrease low sagebrush and increase bluebunch wheatgrass-forb composition.

Relationship to Other Studies: Hall (1973) described ARAR/FEID-AGSP as a "low sagebrush/bunchgrass" plant community type in the Blue and Ochoco Mountains. Mueggler and Stewart (1980) identified ARAR/FEID and ARAR/AGSP habitat types in Montana.

Low sagebrush/Sandberg's bluegrass plant association
Artemisia arbuscula/Poa sandbergii
ARAR/POSA3 (SD92 21)



Aldrich Mountain (Bear Valley RD, Malheur NF)

Table of Principal Species (n = 4)

Species	Code	Mean Cov (%)	Cons. (%)	Range
low sagebrush	ARAR	18	100	5-35
Sandberg's bluegrass	POSA3	18	100	8-40
Idaho fescue	FEID	2	75	1-3
bluebunch wheatgrass	AGSP	2	50	1-2
dwarf squirreltail	SIHYH	5	50	2-8
sandwort	ARENA	2	75	1-4
phlox	PHLOX	2	50	1-2
bighead clover	TRMA	2	50	1-2
scabland fleabane	ERBL	2	50	1-3
penstemons	PENST	1	50	1-1

ENVIRONMENT
LOCATION: South
ELEVATION: 5000-6950 ft. (6031 ft.)
ASPECT: Southerly exposures
SLOPE: 1-15% (7%)
TERRAIN FEATURES: Ridgetop and upper 1/3 of slope on convex surfaces in steep, rough to undulating or flat terrain.
SOIL DEPTH: 3-9 in. (6 in.)
ASH DEPTH:
SURFACE SOIL TEXTURES: sandy clay loam, silt loam
SUBSURFACE SOIL TEXTURES: sandy clay loam, silt loam, clay loam
COARSE FRAGMENTS: 20-33% (27%)
PARENT MATERIAL: Residuum and colluvium of basalt.

PRODUCTION (n = 4)
HERBAGE PRODUCTION (LBS/ACRE AIR DRY): 100-250 (181)
TOTAL BASAL AREA (SQ FT/ACRE):

SOIL SURFACE CHARACTERISTICS

ELEMENT	% COVER	RANGE
ROCK	45	30-60
PAVEMENT	17	5-40
BAREGROUND	11	5-20
MOSS	7	2-15

UTILIZATION RESPONSE

D - FEID, AGSP
IP - POSA3
IU - SIHYH, ARENA, ERIGE
INV - ANNUAL BROMES

Veg. Composition: The ARAR/POSA3 community occurs on scablands (soil depth less than 10 inches). The dominant bunchgrass in late seral stages of succession is Sandberg's bluegrass (POSA3). Idaho fescue and bluebunch wheatgrass, if present, are at low coverages. Forbs with tolerances for dry, warm environmental conditions on scablands are sandwort (ARENA), phlox, bighead clover (TRMA), low pussytoes (ANDI), and lanceleaved stonecrop (SELA2). Dwarf squirreltail (SIHYH) and onespike oatgrass (DAUN) are drought-tolerant grasses that are often present.

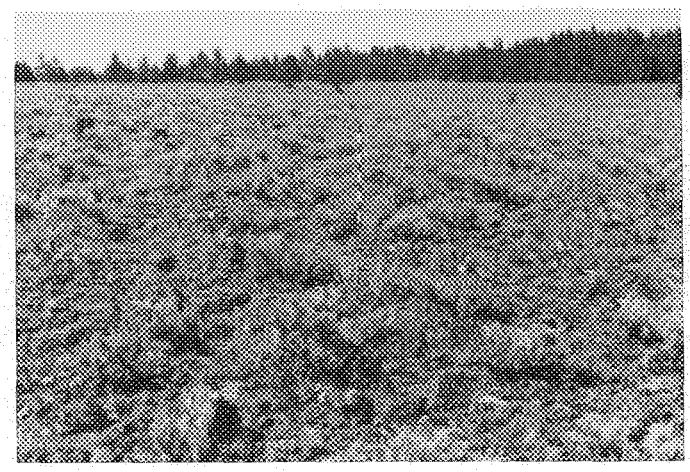
Typal Comparisons: The ARAR/POSA3 community is mid to upper montane on gentle slopes at ridgetop locations. Sampled locations were principally in the Ochoco and southern Blue Mountains. The scabland community occurs on shallow soil with fractured bedrock of basalt. Productivity of herbage was low (mean = 181 lbs/acre).

Successional Relationships: Scabland vegetation is infrequently burned. The primary disturbance event is annual frost heaving of the thin soil mantle when the scabland soils are wet, frozen, and thaw in late winter and early spring. Trafficking by animals and vehicles also churns the soil-plant-rock surface and allows wind and water to erode these sites. With grazing disturbance, dwarf squirreltail (SIHYH), fleabanes, and annuals increase. Mosses decline and bare ground-erosion pavement-rock percentages increase with degrading of ARAR/POSA3 sites.

Management Considerations: Fire is injurious to low sagebrush. Use of prescribed fire in these communities may not result in effective burns. Burns will not provide an improvement in quality or plant composition. Reseeding should not be attempted due to frost heaving and erosion-prone nature of scabland. Limited use of ARAR/POSA3 scabland will help to retain a tight plant-rock-soil matrix and to retain soil moisture, prevent frost heaving of soil, and prevent subsequent erosion. Deer and elk use these scablands in early spring when the bluegrass provides the first green forage following the winter snow cover period.

Relationship to Other Studies: The ARAR/POSA3 plant association has not been previously described.

Stiff sagebrush/Sandberg's bluegrass plant association
Artemisia rigida/Poa sandbergii
ARRI/POSA3 (SD91 11)



Rocky Flat (Heppner RD, Umatilla NF)

Table of Principal Species (n = 23)

Species	Code	Mean Cov (%)	Cons. (%)	Range
stiff sagebrush	ARRI	14	100	4-25
Sandberg's bluegrass	POSA3	17	100	1-30
onespike oatgrass	DAUN	3	65	1-7
dwarf squirreltail	SIHYH	2	73	1-7
bluebunch wheatgrass	AGSP	4	30	1-8
Idaho fescue	*FEID*	2	26	1-4
yarrow	ACMIL	1	30	1-1
false agoseris	MITR	2	78	1-3
bighead clover	*TRMA*	9	60	3-20
bisquitroots	LOMAT	4	56	1-19
phlox	PHLOX	4	39	1-20
low pussytoes	ANDI	2	47	1-3
lanceleaved stonecrop	SELA2	3	43	1-7
tapertip onion	ALAC	3	39	1-12
wooley goldenweed	HALA	2	26	1-3
grass-widows	SIIN2	2	39	1-3

ENVIRONMENT
LOCATION: North, central, south
ELEVATION: 4000-5550 ft. (4707 ft.)
ASPECT: All aspects
SLOPE: 0-30% (6%)
TERRAIN FEATURES: Ridgetop, upper, or middle, 1/3 of slope on all surfaces in steep, rough to rolling, undulating, or flat terrain.
SOIL DEPTH: 2-9 in. (6 in.)
ASH DEPTH:
SURFACE SOIL TEXTURES: sandy loam, loam, silt loam, sandy clay loam, clay loam
SUBSURFACE SOIL TEXTURES: loam, sandy clay loam, silt loam, clay loam, clay
COARSE FRAGMENTS: 15-70% (36%)
PARENT MATERIAL: Residuum and colluvium of igneous, sedimentary, and metamorphic rocks.

PRODUCTION (n = 23)
HERBAGE PRODUCTION (LBS/ACRE AIR DRY): 34-303 (167)
TOTAL BASAL AREA (SQ FT/ACRE):

SOIL SURFACE CHARACTERISTICS

ELEMENT	% COVER	RANGE
ROCK	24	8-50
PAVEMENT	20	3-50
BAREGROUND	21	3-40
MOSS	9	3-17

UTILIZATION RESPONSE

D - DAUN
IP - POSA3, ARRI
IU - SIHYH, TRMA, PHLOX, SELA2, ACMIL
INV - -

Veg. Composition: The ARRI/POSA3 plant association portrays the POSA3-DAUN scabland plant community where stiff sagebrush occupies fractures in the underlying basalt. Deeper rooted bunchgrasses (AGSP, FEID) may occur as incidental species where deeper soil is afforded within cracked bedrock. Dwarf squirreltail (SIHYH) and onespike oatgrass (DAUN) are often associated with Sandberg's bluegrass. Forbs with fidelity to the dry, warm scabland environment are false agoseris (MITR), bighead clover (TRMA), bisquitroots, phlox, low pussytoes (ANDI), lanceleaved stonecrop (SELA2) and onions.

Typal Comparisons: This is the lowest elevation sagebrush-dominated plant association in the Blue and Ochoco Mountains (mean = 4700 ft.). The ARRI/POSA3 scabland community occurs on gentle slopes and shallow soils over fractured bedrock of varying substrates. Productivity of herbaceous vegetation is lowest of any shrubland (mean = 167 lb/ac.).

Successional Relationships: Although susceptible to mortality by fire, intershrub distances make fire events sporadic and infrequent in these communities. Primary disturbance results from the annual frost heaving of the soil mantle. Animal trafficking can also increase exposure by disturbing the soil-plant-rock surface mosaic. Wind and water subsequently erode these sites. Increasing with disturbance on ARRI/POSA3 sites are bighead clover (TRMA), bisquitroots, phlox, stonecrop (SELA2), and serrated balsamroot (BASE).

Management Considerations: Moderate browsing of shrubs may stimulate leader growth; heavy and frequent hedging may cause sagebrush mortality. Frost heaving is accelerated with increased soil exposure. Reseeding should not be attempted due to 1) frost heaving risk, 2) surface soil erosion hazard, 3) shallow soil depths precluding ability of sites to support may species. Stiff sagebrush is valuable to deer and elk. Fire can be used to eradicate stiff sage when it has invaded deeper soil grasslands due to overgrazing.

Relationship to Other Studies: Stiff sagebrush/Sandberg's bluegrass has been described by Daubenmire (1942, 1970) in eastern Washington; by Hall (1973) in the Blue Mountains; Hironaka, et al (1983) in central Idaho; Tisdale (1986) in the Snake River Canyon of Idaho; and by Johnson and Simon (1987) in the Wallowa Mountains and canyons of northeast Oregon.

Early seral mountain big sagebrush/elk sedge communities

Mountain big sagebrush/mountain brome plant community type
ARTRV/BRCA (n = 3) (no code)

This is an early seral stage of the ARTRV/CAGE plant association resulting from severe overgrazing and/or fire disturbance. The ARTRV/BRCA community has a lack of elk sedge (or elk sedge is present at less than 10% cover). Mountain brome, needlegrass, lupine, and yarrow occur at elevated coverages.

Mountain big sagebrush/western needlegrass community
ARTRV/STOC (n = 1)

This community may be an early seral stage of the ARTRV/CAGE plant association where elk sedge has been lost to overgrazing. Western needlegrass was the only grass occurring in the community. Forbs were prominent with golden buckwheat (ERFL), alpine fleeceflower (POPH), lupine, and wooly eriophyllum (ERLA) occupying the high elevation sites.

Elk sedge communities
CAGE (n = 2) (SS49)

After fire has burned through mountain big sagebrush communities, elk sedge retains it coverage (or may increase); but the sagebrush usually dies. The CAGE plant community reflects the past influence of fire in subalpine settings where sagebrush sites have been burned and elk sedge has responded favorably. Yarrow (ACMIL), mountain brome (BRCA), and western needlegrass (STOC) also exhibit increases with the disturbance.

Table of Principal Species

		ATRTV/BRCA (n=3)		ARTRV/STOC (n=1)		CAGE (n=2)	
Species	**Code**	**Mean Cov (%)**	**Cons. (%)**	**Mean Cov (%)**	**Cons. (%)**	**Mean Cov (%)**	**Cons. (%)**
mountain big sagebrush	ARTRV	42	100	55	100	-	-
mountain snowberry	SYOR	4	100	-	-	1	50
mountain brome	BRCA	7	100	-	-	6	50
western needlegrass	STOC	7	66	7	100	6	50
elk sedge	CAGE	-	-	-	-	50	100
yarrow	ACMIL	2	66	-	-	7	100
western hawkweed	HIAL2	5	66	-	-	2	100
lupine	LUPIN	7	66	7	100	-	-
golden buckwheat	ERFL	-	-	7	100	-	-
alpine fleeceflower	*POPH*	-	-	3	100	-	-
wooly eriophyllum	ERLA	-	-	3	100	-	-
phlox	PHLOX	-	-	-	-	3	50
creamy buckwheat	ERHE	-	-	-	-	20	50

Sitka alder plant communities
Alnus sinuata
ALSI (n = 3) (SM20)

Sitka alder communities are common in the northern Blue Mountains (less common in the southern Blue and Och Mountains). These communities (dominated by alder shrubfields) result from stand replacement burns, snowslides on st slopes, and from stand-replacing tree harvest operations. Usually present with the alder are other shrubs - thimbleb (RUPA), swamp gooseberry (RILA), Scouler willow (SASC), big huckleberry (VAME) - which are associated with gran plant communities. Forbs commonly found are those common in mesic grand fir forest understories - i.e., tiarella (TITF roundleaved violet (VIOR2), bedstraw (GATR), and sidebells pyrola (PYSE).

These communities occur on deep forest-producing soils with ash caps. They are located at mid elevations on mode to steep mountain slopes; usually at upper to mid slope positions. Sitka alder tends to occur in the northern and central E Mountains.

Alder shrublands provide important cover for deer and elk, bear and grouse. Alder are important nutrient cycling pla providing mycorrhiza to the soil.

Snowbrush ceanothus plant communities
Ceanothus velutinus
CEVE (n=1)

Snowbrush ceanothus - dominated shrublands result from hot stand replacement burns in grand fir plant communities. fires scarify the seed embedded in the soil and duff resulting in germination and establishment of a dense shrubla Associated with ceanothus are other fire pioneering shrub species - i.e., Oregon boxwood (PAMY), common snowb (SYAL), and spiraea (SPBE). Herbaceous vegetation is usually sparse. Columbia brome (BRVU), bedstraw (GATR), Piper's anemone (ANPI) may be associated.

Ceanothus are important nitrogen-fixing plants providing soil fertility, nutritional browse for deer, and add to the diver of the landscape.

Common snowberry plant communities
Symphoricarpos albus
SYAL (n = 4) (SM31)

These shrublands are often masked by growth of grasses and sedges. In these shrublands, snowberry is short statured rhizomatous with grasses and sedges often more dominant. Birchleaf spiraea (SPBE) may occur with the snowbe Graminoids are elk sedge (CAGE), bluebunch wheatgrass (AGSP), Sandberg's bluegrass (POSA3), prairie junegr (KOCR), and Kentucky bluegrass (POPR). Forbs commonly associated are creamy buckwheat (ERHE), sticky cinque (POGL), and yarrow (ACMIL).

Sampled SYAL shrublands occurred from 2200 ft. to 5800 ft. (mean = 4179 ft.) on varied soils over basalt. Th communities were found on steep slopes at upper, mid, and lower slope positions. This shrubland is especially promir in the northern and central Blue Mountains.

Common snowberry is resistant to fire and sprouts vigorously after burning. Reduction of snowberry shrublands can achieved by combining high intensity burning with heavy overgrazing. The shrublands are desirable for browse an provide a diverse offering to livestock and big game animals. The species withstands light and moderate grazing press

Mountain snowberry plant communities
Symphoricarpos oreophilus
SYOR (n = 1) (SM32)

Mountain snowberry communities occur as transitions between forest and grassland in the Blue-Ochoco Mountains. They may be found on canyon ridges, mountain slopes and on mounded topography. These transitional areas, or ecotones, provide important "edge" for wildlife and enhance species diversity and landscape diversity.

Mountain snowberry is the dominant shrub. Elk sedge (CAGE) and Kentucky bluegrass (POPR) are the primary graminoids. Associated forbs are creamy buckwheat (ERHE), sticky cinquefoil (POGL), slender cinquefoil (POGR), red avens (GETR), lupines and fleabanes. When degraded by overgrazing Kentucky bluegrass (POPR), yarrow (ACMIL), creamy buckwheat (ERHE), fleabanes, lupines, and deerhorn (CLPU) tend to increase and replace the sedge-bunchgrass component.

Mountain-mahogany/elk sedge plant communities
Cercocarpus ledifolius/Carex geyeri
CELE/CAGE (n = 1) (SD40)

At high elevations, on southerly slopes, mountain-mahogany shrublands occur on rocky talus or rocky rims. These communities may have mountain big sagebrush (ARTRV) associated. Elk sedge (CAGE) is the prominent herb. Golden buckwheat (ERFL), sandwort (ARENA), western hawkweed (HIAL2) and pussytoes (ANTEN) may be present.

Mountain-mahogany stands are heavily used by big game species for browse, cover, and bedding. Fire is particularly injurious to the shrubs. Elk sedge is promoted with burning.

Idaho fescue - bluebunch wheatgrass plant association
Festuca idahoensis - Agropyron spicatum
FEID-AGSP (GB59)

Pataha Bunchgrass RNA (Pomeroy RD, Umatilla NF)

Table of Principal Species (n = 28)

Species	Code	Mean Cov (%)	Cons. (%)	Range
Idaho fescue	FEID	23	100	3-75
bluebunch wheatgrass	AGSP	17	89	1-30
Sandberg's bluegrass	POSA3	12	82	1-30
prairie junegrass	KOCR	5	42	1-15
annual bromes	BROMU	9	18	1-20
yarrow	ACMIL	3	89	1-10
creamy buckwheat	ERHE	8	53	1-20
phlox	PHLOX	5	35	1-16
bisquitroots	LOMAT	3	50	1-7
hawksbeards	CREPI	1	32	1-3
arrowleaf balsamroot	BASA	1	21	1-2
serrated balsamroot	BASE	4	28	1-10
pale agoseris	AGGL	2	25	1-4
lupines	LUPIN	5	43	1-25
fleabanes	ERIGE	1	43	1-3

ENVIRONMENT
LOCATION: North, central, south
ELEVATION: 3900-5920 ft. (4627 ft.)
ASPECT: All aspects
SLOPE: 0-110% (28%)
TERRAIN FEATURES: Ridgetop, upper, or middle 1/3 of slope on flat or convex surfaces in steep, rough to rolling, undulating, or flat terrain.
SOIL DEPTH: 10-44 in. (18 in.)
ASH DEPTH:
SURFACE SOIL TEXTURES: sandy loam, loam, sandy clay loam, silt loam, clay loam
SUBSURFACE SOIL TEXTURES: sandy loam, loam, sandy clay loam, silt loam, silt, silty clay loam, clay
COARSE FRAGMENTS: 0-75% (32%)
PARENT MATERIAL: Residuum and colluvium of igneous and metamorphic rocks, some with loess.

PRODUCTION (n=28)
HERBAGE PRODUCTION (LBS/ACRE AIR DRY): 154-1554 (534)
TOTAL BASAL AREA (SQ FT/ACRE):

SOIL SURFACE CHARACTERISTICS

ELEMENT	% COVER	RANGE
ROCK	16	1-56
PAVEMENT	7	1-33
BAREGROUND	11	1-27
MOSS	10	1-31

UTILIZATION RESPONSE

D - FEID, AGSP
IP - POSA3, KOCR, BASA, POPR
IU - ACMIL, ERHE, PHLOX, GETR
INV - ANNUAL BROMES, ASTRA, WYAM

Veg. Composition: This is one of the most common bunchgrass plant associations in the Blue Mountains. Soils are deep permitting establishment by the three principal Blue-Ochoco bunchgrasses - Idaho fescue (FEID), bluebunch wheatgrass (AGSP), Sandberg's bluegrass (POSA3). Forbs are many and varied. Prominent are yarrow (ACMIL), creamy buckwheat (ERHE), and bisquitroots (LOMAT).

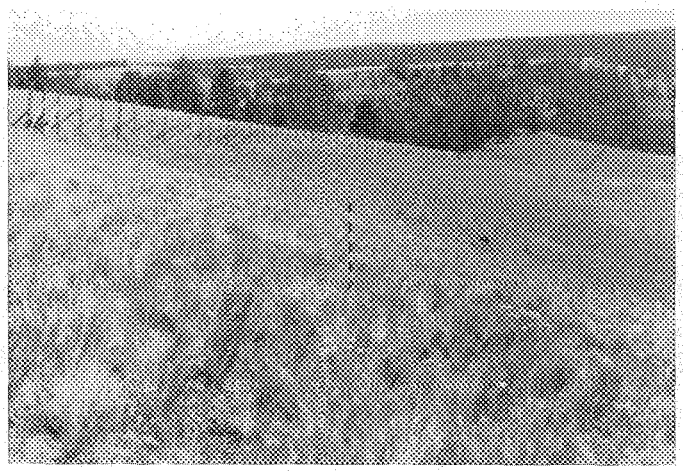
Typal Comparisons: FEID-AGSP plant communities often occur at higher elevations, on less stony soils and have less surface rock than AGSP-POSA3 plant communities. They tend to be more productive in herbaceous vegetation (534 vs. 456 lb/ac.). These communities occur throughout the Blue and Ochoco Mountains on gentle to steep slopes from ridgetop locations to toe slopes on moderately deep soils.

Successional Relationships: Fire and grazing promote successional change. Bunchgrasses are stimulated to improved vigor by fire. Prairie junegrass (KOCR), Sandberg's bluegrass (POSA3), and bluebunch wheatgrass (AGSP) are often promoted by fire. Degraded FEID-AGSP (i.e., - overgrazing, rotational slumping) often show increases in annual bromes (BROMU), bulbous bluegrass (POBU), Kentucky bluegrass (POPR), lupines (LUPIN), fleabanes (ERIGE), phlox (PHLOX), yarrow (ACMIL), creamy buckwheat (ERHE), red avens (GETR), cinquefoils (POTEN), and milkvetches (ASTRA). Balsamroots (BASE, BASA) and mule's ears (WYAM) form extensive stands on some FEID-AGSP sites that have been severely overgrazed. Sandberg's bluegrass was 6% more abundant on gentle slopes (less than 20% slope) than steep slope FEID-AGSP communities. All other associated species had equivalent coverages irregardless of slope differentiation.

Management Considerations: Cool, light burns in late winter or early spring can enhance the quality of the fescue and bluebunch wheatgrass. Early grazing may deter seed formation and be detrimental to bunchgrass vigor if continued over several seasons. Early seral stages are likely from continued use by wild and domestic ungulates on gentle slopes and ridgetops. More diverse mid seral vegetation may be promoted by dual use of fire and grazing to achieve increased forbs and annual vegetation.

Relationship to Other Studies: Daubenmire (1970) described AGSP-FEID in eastern Washington; Hall (1973) devided bunchgrasses into four plant community types based on depth of soil and steepness of slopes in the Blue Mountains Mueggler and Stewart (1980) described FEID-AGSP in Montana; and Johnson and Simon (1987) defferentiated FEID-AGSP into three plant associations in the Wallowa-Snake of northeast Oregon (FEID-AGSP/LUSE, FEID-AGSP/BASA and FEID-KOCR).

Bluebunch wheatgrass - Sandberg's bluegrass plant association
Agropyron spicatum - Poa sandbergii
AGSP-POSA3 (GB41)



Alder Gulch (Pomeroy RD, Umatilla NF)

Table of Principal Species (n = 29)

Species	Code	Mean Cov (%)	Cons. (%)	Range
bluebunch wheatgrass	AGSP	29	100	2-65
Sandberg's bluegrass	POSA3	10	96	1-30
Idaho fescue	FEID	3	31	1-7
prairie junegrass	KOCR	6	31	1-20
yarrow	ACMIL	3	79	1-10
creamy buckwheat	ERHE	4	55	1-15
bisquitroots	LOMAT	2	59	1-7

ENVIRONMENT
LOCATION: North, central, south
ELEVATION: 2950-5850 ft. (4447 ft.)
ASPECT: Southerly exposures
SLOPE: 1-100% (45%)
TERRAIN FEATURES: Ridgetop, upper, middle, or lower 1/3 of slope on all surfaces in steep, rough to rolling, or undulating terrain.
SOIL DEPTH: 8-42 in. (20 in.)
ASH DEPTH:
SURFACE SOIL TEXTURES: sandy loam, clay loam
SUBSURFACE SOIL TEXTURES: sandy loam, clay
COARSE FRAGMENTS: 5-75% (42%)
PARENT MATERIAL: Residuum and colluvium of igneous, sedimentary, or metamorphic rocks with loess.

PRODUCTION (n=29)
HERBAGE PRODUCTION (LBS/ACRE AIR DRY): 100-980 (456)
TOTAL BASAL AREA (SQ FT/ACRE):

SOIL SURFACE CHARACTERISTICS

ELEMENT	% COVER	RANGE
ROCK	23	3-60
PAVEMENT	12	3-40
BAREGROUND	17	3-60
MOSS	22	2-80

UTILIZATION RESPONSE

D - AGSP, FEID
IP - POSA3, KOCR
IU - ACMIL, ERHE, PHLOX, STOC
INV - LUPIN, ASTRA, ANNUAL BROMES

Veg. Composition: These communities occur on deep soils capable of producing bluebunch wheatgrass (AGSP). Idaho fescue (FEID) is limited, or absent, due to warmer, drier conditions. Sandberg's bluegrass (POSA3) is usually present and abundant. Forbs are usually scattered and sparse. The more commonly occurring forbs are yarrow (ACMIL), creamy buckwheat (ERHE), and bisquitroots (LOMAT).

Typal Comparisons: Comparison of AGSP-POSA3 on gentle slopes and steep slopes provided the following:

1. Bunchgrasses were 15% more abundant on gentle slopes (58% vs 43%)
2. Rock, pavement and bareground was 9% greater on steep slopes (55% vs 46%)
3. Creamy buckwheat was more prevalent on steep slopes (6% vs 1%)
4. Sandberg's bluegrass coverage was twice as great on gentle slopes (15% vs 7%)

(See FEID-AGSP for comparison to AGSP-POSA3)

Successional Relationships: Grazing and gravity-fed slope movements may retard succession. Bluebunch wheatgrass and Sandberg's bluegrass are invigorated by most fire events. Degraded AGSP-POSA3 communities (from overgrazing) may show increased coverage by yarrow (ACMIL), creamy buckwheat (ERHE), bisquitroots (LOMAT), phlox (PHLOX), lupines (LUPIN), milkvetches (ASTRA), annual bromes (BROMU), and western needlegrass (STOC).

Management Considerations: Light burns occurring after seed maturity can enhance the competitive ability of AGSP. Where cattle, deer and elk graze, and use is heavy, POSA3 often declines from continued overgrazing and trampling. Early season use on steep slopes can also negatively impact the smaller POSA3 bunchgrasses. Especially impacted are south slopes where elk and deer congregate in early spring when soils are saturated with moisture and plants are prone to damage. Plant loss from uprooting due to use by animals and slope movement is especially high at this time.

Relationship to Other Studies: Daubenmire (1970) first defined AGSP-POSA3 in eastern Washington; Hall (1973) included AGSP-POSA3 in "bunchgrasses on steep, gentle, deep and shallow" plant community types of the Blue Mountains; Tisdale (1986) defined AGSP-POSA3 in the Snake River Canyon in Idaho; Mueggler and Stewart (1980) classified AGSP-POSA3 in Montana; and Johnson and Simon (1987) differentiated AGSP-POSA3 into eight plant associations in the Wallowa Mountains and adjacent canyonlands of northeast Oregon.

Sandberg's bluegrass - onespike oatgrass plant association
Poa sandbergii - Danthonia unispicata
POSA3-DAUN (GB91 11)

Scott Spring (North Fork John Day RD, Umatilla NF)

Table of Principal Species (n = 10)

Species	Code	Mean Cov (%)	Cons. (%)	Range
Sandberg's bluegrass	POSA3	17	100	3-35
onespike oatgrass	DAUN	17	60	1-60
dwarf squirreltail	SIHYH	2	40	1-3
yarrow	ACMIL	3	80	1-7
low pussytoes	ANDI	5	70	1-12
lanceleaved stonecrop	SELA2	2	50	1-3
bisquitroots	LOMAT	7	80	1-29
serrated balsamroot	BASE	7	50	1-20

ENVIRONMENT
LOCATION: North, central, south
ELEVATION: 3800-6950 ft. (5203 ft.)
ASPECT: Principally southerly exposures
SLOPE: 1-6% (4%)
TERRAIN FEATURES: Ridgetop positions on flat or convex surfaces in steep, rolling to undulating or flat terrain.
SOIL DEPTH: 6-10 in. (7 in.)
ASH DEPTH:
SURFACE SOIL TEXTURES: sandy loam, silt loam
SUBSURFACE SOIL TEXTURES: sandy loam, clay loam
COARSE FRAGMENTS: 10-40% (27%)
PARENT MATERIAL: Residuum of igneous, sedimentary, and metamorphic rocks.

PRODUCTION (n = 10)
HERBAGE PRODUCTION (LBS/ACRE AIR DRY): 100-300 (169)
TOTAL BASAL AREA (SQ FT/ACRE):

SOIL SURFACE CHARACTERISTICS

ELEMENT	% COVER	RANGE
ROCK	21	2-60
PAVEMENT	13	1-40
BAREGROUND	29	7-42
MOSS	21	5-60

UTILIZATION RESPONSE

D - DAUN
IP - POSA3
IU - SIHYH, ACMIL, ANDI, SELA2, TRMA
INV - ANNUAL BROMES

Veg. Composition: A scabland community where shallow soils overlie an impervious non-fractured basalt bedrock. Deeper soil bunchgrasses and shrubs cannot persist. Dominant plants in late seral communities are Sandberg's bluegrass and onespike oatgrass. Dwarf squirreltail (SIHYH) is often associated. Commonly occurring forbs are bisquitroots (LOMAT), serrated balsamroot (BASE), low pussytoes (ANDI), lanceleaved stonecrop (SELA2), and yarrow (ACMIL).

Typal Comparisons: These scabland communities occur throughout the Blue and Ochoco Mountains with great elevational variation (3800 ft. to 7000 ft.). Slopes are gentle, soil depths are shallow, and substrates vary (basalts, andesites, rhyolite). Sampled plots had the highest combined surface rock, pavement, bareground percentage (63%) of any Blue-Ochoco grasslands. Herbage production is lowest of any grassland in the Blue-Ochoco Mountains (Mean = 169 lbs/Ac.).

Successional Relationships: The exposure of bare ground from trampling damage can initiate severe disturbance. The moisture retaining capability of the plant-moss-rock surface is lessened with degradation. Frost heaving of plants and rocks, and subsequent soil loss from wind and water erosion, degrades the site. Increasing in earlier seral stands are western needlegrass (STOC), bisquitroots (LOMAT), lanceleaved stonecrop (SELA2), onions (ALLIU), bighead clover (TRMA) and low pussytoes.

Management Considerations: It is difficult for fire to burn in POSA3-DAUN due to high surface rock cover and insufficient fuel to carry fire. Revegetation should not be attemped. Soils are too shallow, rocky, and disturbance of this plant cover only promotes frost heaving and soil erosion. POSA3 provides important early nutrition to deer and elk at a time when other vegetation has not "greened" nor initiated annual growth. Early spring use when soils are saturated may result in trampling and site damage.

Relationship to Other Studies: Hall (1973) described this plant association as "bluegrass scabland" in the Blue Mountains. Volland (1976) also described a "bluegrass scabland" on pumice in central Oregon. Johnson and Simon (1987) described a POSA3-DAUN plant association in the Wallowa-Snake of northeast Oregon.

Bluebunch wheatgrass - Sandberg's bluegrass - onespike oatgrass plant community type
Agropyron spicatum - Poa sandbergii - Danthonia unispicata
AGSP-POSA3-DAUN (GB49 11)

A scabland community occupying gentle to moderately steep slopes with enough fracturing of the bedrock to support bluebunch wheatgrass. Scabland vegetation is prominent. Onespike oatgrass (DAUN), bighead clover (TRMA), and Sandberg's bluegrass (POSA3) are commonly found on scablands. Disturbance from trampling and overuse by animals may be indicated by high coverages of bighead clover (TRMA), milkvetches (ASTRA), phlox (PHLOX), and lanceleaved stonecrop (SELA2).

This community is widespread in the Blue and Ochoco Mtns. It is given plant community type status only because of the low number of sampled plots used to describe it. Plant communities which resemble AGSP-POSA3-DAUN climax vegetation have been created as disclimaxes from FEID-AGSP and AGSP-POSA3 plant associations by severe overgrazing of ridgetops and benches. Soil loss, compaction and surface erosion by wind and water have created the disclimactic AGSP-POSA3-DAUN communities. Trampling may reduce the grass-forb-moss foliar cover promoting pavement and surface soil loss. Use by livestock should occur after flowering by AGSP and after soils have lost saturation and wetness.

UTILIZATION RESPONSE
D - AGSP, DAUN
IP - POSA3
IU - ACMIL, TRMA
INV - ASTRA

Table of Principal Species (n = 3)

Species	Code	Mean Cov (%)	Cons. (%)	Range
bluebunch wheatgrass	AGSP	21	100	10-40
Sandberg's bluegrass	POSA3	17	100	5-25
onespike oatgrass	DAUN	3	66	2-3
yarrow	ACMIL	3	66	1-5
bighead clover	TRMA	10	66	7-12
tapertip onion	ALAC	3	66	1-5
fleabanes	ERIGE	1	100	1-1
bisquitroots	LOMAT	5	100	1-10

Green fescue plant communities
Festuca viridula plant communities
FEVI (n = 2) (GS11)

Green fescue plant communities are extremely rare in the Blue Mountains. Relict stands are known primarily from the northern Blue Mountains. Severely overgrazed and eroded ridgetops in the northern Blue Mountains may once have supported green fescue. The species is much more prevalent in the adjacent Wallowa Mountains. Green fescue will dominate in good ecologic condition. Often associated with the species is yarrow (ACMIL), lupines (LUPIN), and rushes (JUPA, JUDR). Bare ground and pavement may account for 50-70% of the area within a stand. This results from water and wind erosion following intense sheep overgrazing of green fescue grasslands earlier in the century.

Sampled green fescue sites were in the northern Blue Mountains on the Umatilla National Forest below 6000 ft. elevation. The sites were on gentle ridgetops where past grazing has resulted in bareground and erosion pavement at nearly 70% surface cover. Herbage productivities averaged only 340 lb./acre.

Late season fires, when soil and plant moisture contents are lowest, may cause damage to FEVI plants. Lack of fire has promoted PIAL invasion into FEVI grasslands. Fire has played a role in maintenance of high elevation grasslands in the Blue, Wallowa, and Ochoco Mountains. Cattle grazing, and heavy concentrations of elk, can cause severe erosion opportunities. Sheep use should promote fescue and retard forbfields under a moderate grazing regime.

Subalpine Idaho fescue plant communities
Festuca idahoensis plant communities
FEID (n = 4) (GS12)

Idaho fescue communities often occur on subalpine ridges and summits of central and southern Blue Mountain peaks. The stands of fescue are dense and dominate over all other vegetation in good ecologic condition. Other associated grasses present are bluebunch wheatgrass (AGSP), in its rhizomatous habit, and Sandberg's bluegrass (POSA3). Forbs commonly occurring are creamy buckwheat (ERHE), yarrow (ACMIL), red avens (GETR), alpine pussytoes (ANAL), hawksbeard (CREPI), penstemons (PENST), and golden buckwheat (ERFL). More investigation is required to adequately differentiate these Idaho fescue communities from lower elevation FEID-dominated communities.

Sampled plots were essentially above 7000 ft. elevation on gentle to steep slopes at ridgetop and upper slope positions. Soils were moderate to deep over basalt, andesite and sedimentary substrates. Surface rock, pavement, bareground were low, with resulted high cover by mosses and vascular herbaceous vegetation.

High elevation fescue communities are prone to damage from early season use which causes trampling damage, plant uprooting and utilization before flowering of grasses. Fire can help maintain high elevation fescue when burns are cool and rapid (light). Fescue would be damaged by late season hot burns that would consume the crowns of the plants.

Hood's sedge plant communities
Carex hoodii plant communities
CAHO (n = 1)

These are on overgrazed subalpine slope where Hood's sedge (CAHO) and Idaho fescue (FEID) were probably more equitably distributed in the past. They are now dominated by Hood's sedge and grasses that have increased with the degradation. The grasses are western needlegrass (STOC), mountain brome (BRCA), and bottlebrush squirreltail (SIHY). More investigation is needed to determine status of Hood's sedge in the subalpine.

Western needlegrass plant communities
Stipa occidentalis plant communities
STOC (n = 3) (GS10)

These are degenerated communities at subalpine elevations (above 7000 ft.). It is considered that Idaho fescue (FEID), green fescue (FEVI), or elk sedge (CAGE) communities were abundant on these sites prior to intense sheep overgrazing of the subalpine ranges early in the century. Lodgepole pine, subalpine fir or whitebark pine may occur incidentally. *Western needlegrass (STOC) and bottlebrush squirreltail (SIHY) are often co-dominant as the principal increasing* grasses. Other plants usually present are mountain big sagebrush (ARTRV), white hawkweed (HIAL), phlox (PHLOX), and hawkweeds (CREPI). More investigation is needed to assign western needlegrass communities to plant associations.

Western needlegrass sites are capable of producing much higher herbage than is provided by these early seral communities (mean = 300 lb/ac.). The soils are deep (mean = 33 inches) and moderately stony. Sampled plots averaged 67% erosion pavement on relatively rock-free surfaces. These disclimax communities once maintained higher productivity, later seral sedges and grasses.

These harsh high elevation sites are cold and dry in the short summer growing season. Rehabilitation efforts may be futile.

GLOSSARY

Alluvium - A soil that has been deposited by water transport.

Ash (volcanic) - Fine pyroclastic material under 4.0 mm diameter (pertaining to fragmental materials produced by usually explosive, aerial ejection of clastic particles from a volcanic vent).

Climax (community) - The stable community in an ecological succession which is able to reproduce itself indefinitely under existing environmental conditions in the absence of disturbance. The final stage of succession.

Climax (species) - Species that are self perpetuating in the absence of disturbance.

Climax (vegetation) - The pattern or complex of climax communities in a landscape corresponding to the pattern of environmental gradients or habitats.

Colluvium - Unconsolidated earth material deposited on or at the base of steep slopes by mass wasting (direct gravitational action) and local unconcentrated runoff.

Coverage - The area of ground included in a vertical projection of individual plant canopies.

Depauperate - A stand with sparse ground covering vegetation due to 1) tree overstory density precluding sufficient light for understory plant growth, or 2) a deep restrictive litter of duff layer or, 3) a combination of limiting site factors.

Disclimax - A type of climax community which is maintained by either continuous or intermittent disturbance (i.e. - grazing, burning, logging) to a severity that the natural climax community is altered.

Dominant - A plant or group of plants which by their collective size, mass, or number exert the most influence on other components of the ecosystem.

Ecologic Equivalents - Plants having very similar environmental requirements.

Forb - An herbaceous plant other than a sedge, grass, or other plant with similar grass-like foliage.

Graminoid - A herbaceous grass or grass-like plant.

Habitat type: An aggregation of all land areas capable of supporting similar plant communities at climax.

Herb - A plant that dies back to the ground surface each year.

Indicator Species - A species which is sensitive to important environmental features of a site such that it's constancy or abundance reflect significant changes in environmental factors.

Layer - The layer which defines the characteristic physiognomy of the vegetation (at any geographic or classification scale) being considered.

Loess - Fine grained wind-deposited material predominantly of silt-size particles.

Plant Association - A unit of vegetation classification based on the projected climax community type.

Plant Community - A general term for an assemblage of plants living together and interacting among themselves in a specific location; no particular ecological status is implied.

Plant Community Type - An aggregation of all plant communities with similar structure and floristic composition. A unit of vegetation within a classification with no particular successional status implied.

Residuum - A soil that has developed in place from the local geologic formation. Usually residual soils have been formed from weathering and have not been significantly transported from the formative location.

Savanna - A type of vegetation in which tall, widely spaced plants (i.e., trees) are scattered over land otherwise covered with low-growing plants.

Seral - A stage of temporary communities in a successional sequence.

Series - An aggregation of taxonomically related associations that takes the name of climax species that dominate tl principal layer. A taxonomic unit in a classification.

Stand - Vegetation occupying a specific area and sufficiently uniform in species composition, age arrangement, structu and condition as to be distinguished from the vegetation on adjoining areas.

Succession - The unidirectional change in species composition resulting from the replacement of one community wi another toward some stable end point. This may be progressive from early seral stages toward climax or retrogressi from late seral stages toward very early seral stages.

Type - A term synonymous to the classified unit and used to facilitate readability of the text.

Ungulate - Cloven hoofed animals.

Zone - The geographic area of uniform macroclimate where the climatic climax associations share the same character tic species of the principal layer.

LITERATURE CITED

Baldwin, E. M. 1964. *Geology of Oregon.* Edwards Brothers, Inc., Ann Arbor, Michigan. 165 pp.

Clausnitzer, R.R. and B. A. Zamora. 1987. *Forest habitat types of the Colville Indian Reservation.* Dept. of Forestry and Range Mgmt., Washington State University, Pullman, Wash. 110 pp.

Cooper, S; K. Neiman; R. Steele; D. Roberts. 1987. *Forest habitat types of northern Idaho: a second approximation.* USDA-Forest Service Gen. Tech. Rep. INT-236, Intermountain Research Station. Ogden, Utah. 103 pp.

Crawford, R. C. and F. D. Johnson. 1985. *Pacific Yew Dominance in Tall Forests, A Classification Dilemma.* Canadian Journal of Botany. 63:592-602.

Daubenmire, R. F. 1942. *An Ecological Study of the Vegetation of Southeastern Washington and Adjacent Idaho.* Ecol. Monogr. 12:53-79.

Daubenmire, R. 1956. *Climate as a determinant of vegetation in eastern Washington and northern Idaho.* Ecol. Mono. 26:131-154.

Daubenmire, R. F., and Jean B. 1968. *Forest Vegetation of Eastern Washington and Northern Idaho.* Wash. Agric. Exp. Sta. Tech. Bull. 60, 104 pp.

Daubenmire, R. F. 1970. *Steppe Vegetation of Washington.* Wash. Agric. Exp. Sta. Tech. Bull. 62, 131 pp.

Fryxell, R. 1965. *Mazama and Glacier Peak Volcanic Ash Layers: Relative Ages.* Science, Vol. 147.

Hall, F. C. 1973. *Plant communities of the Blue Mountains in eastern Oregon and southeastern Washington.* USDA Forest Service, PNW Region, R-6 Area Guide 3-1, 62 pp.

Hill, M. O. 1979. *DECORANA - A fortran program for detrended correspondence analysis and reciprocal averaging.* Ecology and Systematics, Cornell University, Ithaca, New York. 30 pp.

Hill, M. O. 1979. *TWINSPAN - A fortran program for arranging multivariate data in an ordered two-way table by classification of individuals and attributes.* Ecology and Systematics, Cornell University, Ithaca, New York. 48 pp.

Hironaka, M.; Fosberg, M. A.; and A. H. Winward. 1983. *Sagebrush-grass habitat types of southern Idaho.* Forest, Wildlife and Range Exper. Sta., U. of Idaho. Moscow, Idaho, 44 pp.

John, T. and D. Tart. 1986. *Forested Plant Associations of the Yakima drainage within the Yakima Indian Reservation (Draft).* 147 pp.

Johnson, C. G., and S. Simon. 1987. *Plant Associations of the Wallowa-Snake Province.* USDA-Forest Service, Pacific NW Region, R6-ECOL-TP-225A-86. 399 pp.

Kovalchik, B. L. 1987. *Riparian zone associations of the Deschutes, Fremont, Ochoco and Winema National Forests.* USDA Forest Service, Pacific Northwest Region, R6 ECOL TP-279-87.

Mueggler, W. F. and W. L. Stewart. 1980. *Grassland and shrubland habitat types of western Montana.* USDA Forest Service, Gen. Tech. Report INT-66. 154 pp.

Pfister, Robert D.; B. L. Kovalchik: S. F. Arno; and R. C. Presby. 1977. *Forest habitat types of Montana.* USDA-Forest Service, Int. For. and Range Exp. Sta. Gen. Tech. Report INT-34. Ogden, Utah.

Schlatterer, E. G. 1972. *A preliminary description of plant communities found on the Sawtooth, White Cloud, Boulder, and Pioneer Mountains.* USDA Forest Service, INT. Region, Ogden, Utah. 111 pp.

Steele, Robert; R. D. Pfister; R. A. Ryker; J. A. Kittams. 1981. *Forest habitat types of central Idaho.* USDA-Forest Service Int. For. and Range Exp. Stn. Gen. Tech. Report. INT-115, Ogden, Utah.

Steele, Robert; S. V. Cooper; D. M. Ondov; D. W. Roberts; R. D. Pfister. 1983. *Forest habitat types of eastern Idaho western Wyoming*. Int. For. and Range Exp. Stn. Gen. Tech. Report, INT-144. Ogden, Utah.

Tisdale, E. W. 1986. *Canyon Grasslands and Associated Shrublands of West-central Idaho and Adjacent Areas*. Uni of Idaho, Moscow, Idaho. Forest, Wildlife and Range Exper. Sta. Bulletin 40. 42 pp.

Trewartha, Glenn T. 1968. *An Introduction to Climate*. McGraw-Hill, New York, New York. 408 pp.

USDA FS-R6 Staff. 1985. *Draft Management Guidelines: for soils derived from volcanic ash in the Blue Mountains o Oregon and Washington* - USDA Forest Service. 266 pp.

Volland, L. A. 1988. *Plant communities of the central Oregon pumice zone*. USDA-Forest Service, PNW Region. R-6 Are Guide 4-2. 113 pp.

Volland, L. A. and M. Connelly. 1978. *Computer analysis of ecological data: analysis and programs*. USDA-Forest Service, PNW Region. R6-ECOL-79-003. Portland, Oregon.

Wheeler, D. L. 1987. *Computer Analysis of Ecological Data - A user's manual for the Data General MV-Series*. USDA Forest Service, Siskiyou National Forest (Draft). 45 pp.

Williams, C. K. and T. R. Lillybridge. 1983. *Forested plant associations of the Okanogan National Forest*. USDA-Fore Service, Pacific NW Region, R6-Ecol-132b.

Williams, C. K.; T.R. Lillybridge; and B. G. Smith. 1991. Forested plant associations of the Colville National Forest. USDA-Forest Service, Pacific NW Region, R6-ECOL-TP-008-88.

APPENDIX A TABLE OF TYPES AND RELATIONSHIP TO AREA CLASSIFICATIONS

BLUE-OCHOCO MOUNTAINS CLASSIFICATION

Classified types are plant associations unless followed by (pct) indicating plant community type status or (comm.) indicating plant communities.

Plant Association	No. of Samples	Location[1] N	C	S	Relationship to 1973 Classification[2]	Relationship to Wallowa-Snake Classification[3]
SUBALPINE FIR SERIES						
ABLA2/TRCA3	5	X	X		NEW	Deferred - subalpine[4]
ABLA2/CLUN	5	X			NEW	Classified
ABLA2/LIBO2	7	X	X		NEW	Classified
ABLA2/MEFE	2	X			NEW	Classified
ABLA2/VAME	9	X	X		Retained	Classified
ABLA2/VASC	7	X	X	X	Retained	Classified
ABLA2/CAGE	8		X	X	Retained	
ABLA2/ARCO pct	3	X			NEW	Deferred - subalpine
ABLA2/STOC pct	4		X	X	NEW	Deferred - subalpine
PICO(ABLA2)/VASC pct	7	X	X	X	Retained	Classified
PICO(ABLA2)/VAME/CARU pct	2	X			NEW	
PICO(ABLA2)/VAME pct	2	X	X		NEW	Classified
ABLA2/RHAL comm.	1	X	X		NEW	
ABLA2-PIAL/POPH comm.	3		X	X	NEW	Deferred - subalpine
ABLA2-PIAL/JUDR comm.	2		X	X	NEW	Deferred - subalpine
ABLA2-PIAL/POPU comm.	2		X	X	NEW	Deferred - subalpine
PICO(ABLA2)/CAGE comm.	1			X	NEW	
PICO(ABLA2)/STOC comm.	1		X		NEW	Deferred - subalpine
GRAND FIR SERIES						
ABGR/GYDR	4	X			NEW	
ABGR/POMU-ASCA3	14	X			NEW	
ABGR/TRCA3	16	X			NEW	
ABGR/TABR/CLUN	11	X			NEW	Classified
ABGR/TABR/LIBO2	10	X	X		NEW	
ABGR/ACGL	8	X	X		NEW	Classified
ABGR/CLUN	19	X	X	X	NEW	Classified
ABGR/LIBO2	40	X	X	X	NEW	Classified
ABGR/VAME	11	X	X	X	Retained	Classified
ABGR/VASC-LIBO2	15		X	X	NEW	
ABGR/VASC	13		X	X	NEW	
ABGR/BRVU	4		X	X	NEW	
ABGR/SPBE	9	X	X		NEW	Classified
ABGR/CARU	26		X	X	NEW	Classified
ABGR/CAGE	10		X	X	NEW	
ABGR/ARCO	10			X	NEW	
PICO(ABGR)/VAME-LIBO2 pct	4	X	X		NEW	
PICO(ABGR)/VAME/CARU pct	6		X		NEW	
PICO(ABGR)/VAME pct	2		X		Retained	
PICO(ABGR)/CARU pct	5		X	X	NEW	
PICO(ABGR)/VASC/CARU pct	16		X	X	Retained	
PICO(ABGR)/VAME/PTAQ comm.	1	X			NEW	
PICO(ABGR)/ARNE comm.	1		X		NEW	
PICO(ABGR)/ALSI comm.	2	X			NEW	
ABGR-CHNO/VAME comm.	1			X	NEW	
LODGEPOLE PINE SERIES						
PICO/CARU	8	X	X	X	NEW	
DOUGLAS-FIR SERIES						
PSME/VAME	5		X		NEW	Classified
PSME/PHMA	19	X	X		Retained	Classified
PSME/HODI	8	X			Retained	
PSME/SYAL	29	X	X	X	NEW	Classified
PSME/SYOR	4	X	X	X	NEW	Classified
PSME/CARU	24	X	X	X	NEW	Classified
PSME/CAGE	7		X	X	Retained	
PSME/CELE/CAGE pct	3		X	X	NEW	

Plant Association	No. of Samples	N	C	S	Relationship to 1973 Classification[2]	Relationship to Wallowa-Snake Classification[3]
PONDEROSA PINE SERIES						
PIPO/CELE/CAGE	8		X	X	NEW	
PIPO/CELE/PONE	7			X	NEW	
PIPO/CELE/FEID-AGSP	5		X	X	NEW	
PIPO/SYAL	16	X	X		NEW	Classified
PIPO/SYOR	10		X	X	NEW	
PIPO/CARU	16		X	X	NEW	
PIPO/CAGE	17		X	X	NEW	
PIPO/PUTR/CARO	7			X	Retained	
PIPO/PUTR/CAGE	6		X	X	NEW	
PIPO/PUTR/FEID-AGSP	3		X	X	NEW	
PIPO/ARTRV/FEID-AGSP	6			X	NEW	
PIPO/FEID	16	X	X	X	Retained	Classified
PIPO/AGSP	12	X	X	X	Retained	Classified
PIPO/ARTRV/CAGE comm.	2		X	X	NEW	
PIPO/PERA3 comm.	2		X		NEW	
PIPO/ARAR comm.	1		X		NEW	
PIPO/RHGL comm.	1	X			NEW	
JUNIPER WOODLANDS						
JUOC/PUTR/FEID-AGSP	4		X	X	NEW	
JUOC/FEID-AGSP	7		X	X	Retained	Classified
JUOC/CELE/CAGE comm.	2		X	X	NEW	
JUOC/CELE/FEID-AGSP comm.	2		X	X	NEW	
JUOC/ARTRV/FEID-AGSP comm.	-		X	X	Retained	
JUOC/ARAR comm.	1		X	X	Retained	
JUOC/ARRI comm.	2		X	X	Retained	
SHRUBLANDS						
PHMA-SYAL	5	X			Retained	Classified
CELE/FEID-AGSP	4	X	X	X	NEW (Part of CELE-Grass)	Classified
PUTR/FEID-AGSP	3			X	Retained	Classified
ARTRV/CAGE	13	X	X	X	Retained	Classified
ARTRV/FEID-AGSP	15		X	X	Retained	Classified
ARAR/FEID-AGSP	17		X	X	Retained	
ARAR/POSA3	4			X	NEW (Part of ARAR-bunchgrass)	
ARRI/POSA3	23	X	X	X	Retained	Classified
ARTRV/BRCA pct	3	X	X	X	NEW	
ARTRV/STOC comm.	1	X	X	X	NEW	
CAGE comm.	2	X	X	X	Retained	
ALSI comm.	3	X			NEW	
CEVE comm.	1	X			NEW	
SYAL comm.	4	X	X		Retained	Classified
SYOR comm.	1	X			NEW	Classified
CELE/CAGE comm.	1		X		NEW (Part of CELE-Grass)	Classified
GRASSLANDS						
FEID-AGSP	28	X	X	X	NEW	
AGSP-POSA3	29	X	X	X	NEW	
POSA3-DAUN	10	X	X	X	Retained	
AGSP-POSA3-DAUN pct	3	X	X	X	NEW	
FEVI (subalpine) comm.	2	X			NEW	
FEID (subalpine) comm.	4		X	X	Retained	
CAHO (subalpine) comm.	1		X		NEW	Deferred - subalpine
STOC (subalpine) comm.	3	X	X		NEW	Deferred - subalpine

[1] North - La Grande RD (North of I-84), Walla Walla RD, Pomeroy RD.
Central - La Grande RD (South of I-84), North Fork John Day RD, Heppner RD, Long Creek RD, and Unity RD (Nort of Hwy 26).
South - Bear Valley RD, Burns RD, Prairie City RD, Ochoco NF and Unity RD (South of Hwy 26).

[2] Hall, F.C. 1973. Plant communities of the Blue Mountains in eastern Oregon and southeastern Washington. USDA Fore Service, PNW Region, R-6 Area Guide 3-1, 62 pp.

[3] Johnson, C. C., and S. Simon. 1987. Plant Associations of the Wallowa-Snake Province. USDA Forest Service, Pacif NW Region, R6-ECOL-TP-225A-86. 399 pp.

[4] Deferred - Plots pertaining to subalpine vegetation in the Wallowa and Seven Devils Mountains were not included in th Wallowa-Snake Classification. Subalpine vegetation will be classified and published in a separate field guide for th Area.

APPENDIX B. BLUE-OCHOCO PLANT SPECIES

A LISTING OF SPECIES ENCOUNTERED

CODE	LATIN NAME	COMMON NAME
Trees		
ABGR	ABIES GRANDIS	GRAND FIR OR WHITE FIR
ABLA2	ABIES LASIOCARPA	SUBALPINE FIR
CHNO	CHAMAECYPARIS NOOTKATENSIS	ALASKA YELLOW CEDAR
JUOC	JUNIPERUS OCCIDENTALIS	WESTERN JUNIPER
LAOC	LARIX OCCIDENTALIS	WESTERN LARCH OR TAMARACK
PIEN	PICEA ENGELMANNII	ENGELMAN SPRUCE
PIAL	PINUS ALBICAULIS	WHITEBARK PINE
PICO	PINUS CONTORTA	LODGEPOLE PINE
PIMO	PINUS MONTICOLA	WESTERN WHITE PINE
PIPO	PINUS PONDEROSA	PONDEROSA PINE
POTR	POPULUS TREMULOIDES	QUAKING ASPEN
POTR2	POPULUS TRICHOCARPA	BLACK COTTONWOOD
PSME	PSEUDOTSUGA MENZIESII	DOUGLAS-FIR OR RED FIR
Shrubs		
ACGL	ACER GLABRUM	ROCKY MOUNTAIN MAPLE
ALRU	ALNUS RUBRA	RED ALDER
ALSI	ALNUS SINUATA	SITKA OR THIN-LEAVED ALDER
AMAL	AMELANCHIER ALNIFOLIA	WESTERN SERVICEBERRY
ARNE	ARCTOSTAPHYLOS NEVADENSIS	PINEMAT MANZANITA
ARTEM	ARTEMISIA	SAGEBRUSH
ARAR	ARTEMISIA ARBUSCULA	LOW SAGEBRUSH
ARRI	ARTEMISIA RIGIDA	STIFF OR SCABLAND SAGEBRUSH
ARTRV	*ARTEMISIA TRIDENTATA VASEYANA*	*MOUNTAIN BIG SAGEBRUSH*
BENE	BERBERIS NERVOSA	CASCADE OREGON GRAPE
BERE	BERBERIS REPENS	CREEPING OREGON GRAPE
BEOC	BETULA OCCIDENTALIS	WATER BIRCH
CEANO	CEANOTHUS	CEANOTHUS
CESA	*CEANOTHUS SANGUINEUS*	*REDSTEM CEANOTHUS*
CEVE	CEANOTHUS VELUTINUS	SNOWBRUSH CEANOTHUS, BUCKBRUSH
CELE	CERCOCARPUS LEDIFOLIUS	CURLLEAF MOUNTAIN-MAHOGANY
CHME	CHIMAPHILA MENZIESII	LITTLE PIPSISSEWA
CHUM	CHIMAPHILA UMBELLATA	COMMON PIPSISSEWA OR PRINCE'S PINE
CHNA	CHRYSOTHAMNUS NAUSEOSUS	COMMON OR GRAY RABBITBRUSH
CHVI	CHRYSOTHAMNUS VISIDIFLORUS	GREEN RABBITBUSH
COST	CORNUS STOLONIFERA	RED-OSIER DOGWOOD
CRDO	CRATAEGUS DOUGLASII	BLACK HAWTHORN
HODI	HOLODISCUS DISCOLOR	CREAMBUSH OCEAN-SPRAY
LIBO2	LINNAEA BOREALIS	TWINFLOWER
LOIN	LONICERA INVOLUCRATA	BEARBERRY HONEYSUCKLE OR BLACK TWIN-BERRY
LOUT2	LONICERA UTAHENSIS	UTAH HONEYSUCKLE
MEFE	MENZIESIA FERRUGINEA	FOOL'S HUCKLEBERRY
PAMY	PACHISTIMA MYRSINITES	OREGON BOXWOOD

PERA3	PERAPHYLLUM RAMOSSISIMUM	SQUAW APPLE
PHLE2	PHILADELPHUS LEWISII	SYRINGA OR MOCK ORANGE
PHEM	PHYLLODOCE EMPETRIFORMIS	PINK MOUNTAIN HEATH
PHMA	PHYSOCARPUS MALVACEUS	MALLOW NINEBARK
PRUNU	PRUNUS	CHERRY OR CHOKECHERRY
PUTR	PURSHIA TRIDENTATA	BITTERBRUSH
RHPU	RHAMNUS PURSHIANA	CASCARA
RHAL	RHODODENDRON ALBIFLORUM	CASCADES RHODODENDRON
RHGL	RHUS GLABRA	SMOOTH SUMAC
RIBES	RIBES	CURRANT OR GOOSEBERRY
RICE	RIBES CEREUM	SQUAW CURRANT
RILA	RIBES LASCUSTRE	SWAMP GOOSEBERRY
RIMO	RIBES MONTIGENUM	MOUNTAIN GOOSEBERRY
RIVI	RIBES VISCOSISSIMUM	STICKY CURRANT
ROSA	ROSA	ROSE
ROGY	ROSA GYMNOCARPA	BALDHIP ROSE
RONU	ROSA NUTKANA	NOOTKA ROSE
RUPA	RUBUS PARVIFLORUS	THIMBLEBERRY
SASC	SALIX SCOULERIANA	SCOULER WILLOW
SARA	SAMBUCUS RACEMOSA	BLACK ELDERBERRY
SHCA	SHEPHERDIA CANADENSIS	CANADA BUFFALOBERRY
SOSI	SORBUS SITCHENSIS	SITKA MOUNTAIN-ASH
SPBE	SPIRAEA BETULIFOLIA	BIRCHLEAF SPIRAEA
SYAL	SYMPHORICARPOS ALBUS	COMMON SNOWBERRY
SYALL	SYMPHORICARPOS ALBUS LAEVIGATUS	PACIFIC COMMON SNOWBERRY
SYOR	SYMPHORICARPOS OREOPHILUS	MOUNTAIN SNOWBERRY
TABR	TAXUS BREVIFOLIA	PACIFIC YEW
TECA	TETRADYMIA CANESCENS	GRAY HORSE-BRUSH
VAME	VACCINIUM MEMBRANACEUM	BIG HUCKLEBERRY
VASC	VACCINIUM SCOPARIUM	GROUSE HUCKLEBERRY OR WHORTLEBERRY

Grasses and Grass-like

AGSP	AGROPYRON SPICATUM	BLUEBUNCH WHEATGRASS
AGROS	AGROSTIS	BENTGRASS
AGDI	AGROSTIS DIEGOENSIS	THIN OR LEAFY BENTGRASS
BROMU	BROMUS	BROME
BRBR	BROMUS BRIZAEFORMIS	RATTLESNAKE BROME
BRCA	BROMUS CARINATUS	MOUNTAIN BROME
BRCO	BROMUS COMMUTATUS	HAIRY BROME OR HAIRY CHESS
BRIN	BROMUS INERMIS	SMOOTH BROME
BRJA	BROMUS JAPONICUS	JAPANESE BROME
BRTE	BROMUS TECTORUM	CHEATGRASS
BRVU	BROMUS VULGARIS	COLUMBIA BROME
CALAM	CALAMAGROSTIS	REEDGRASS OR PINEGRASS
CARU	CALAMAGROSTIS RUBESCENS	PINEGRASS
CAREX	CAREX	SEDGE
CACO	CAREX CONCINNOIDES	NORTHWESTERN SEDGE
CAEU	CAREX EURYCARPA	WIDE-FRUITED SEDGE
CAGE	CAREX GEYERI	ELK SEDGE
CAHO	CAREX HOODII	HOOD'S SEDGE
CAPY	CAREX PYRENAICA	PYRENAEAN SEDGE
CARO	CAREX ROSSII	ROSS SEDGE
CILA2	CINNA LATIFOLIA	DROOPING WOODREED
DAGL	DACTYLIS GLOMERATA	ORCHARD GRASS
DAIN	DANTHONIA INTERMEDIA	TIMBER OATGRASS
DASP	DANTHONIA SPICATA	COMMON WILD OATGRASS
DAUN	DANTHONIA UNISPICATA	ONE-SPIKE OATGRASS

ELYMU	ELYMUS	WILDRYE
ELCI	ELYMUS CINEREUS	GIANT WILDRYE
ELGL	*ELYMUS GLAUCUS*	*BLUE WILDRYE*
FEID	FESTUCA IDAHOENSIS	IDAHO FESCUE
FEMI	FESTUCA MICROSTACHYS	SMALL FESCUE
FEOC	FESTUCA OCCIDENTALIS	WESTERN FESCUE
FEVI	FESTUCA VIRIDULA	GREEN FESCUE
GLYCE	GLYCERIA	MANNAGRASS
HORDE	*HORDEUM*	BARLEY
HOJU	HORDEUM JUBATUM	FOXTAIL BARLEY
JUNCU	JUNCUS	RUSH
JUBA	JUNCUS BALTICUS	BALTIC RUSH
JUDR	JUNCUS DRUMMONDII	DRUMMOND'S RUSH
JUPA	JUNCUS PARRYI	PARRY'S RUSH
JUTE	JUNCUS TENUIS	SLENDER RUSH
KOCR	KOELERIA CRISTATA	PRAIRIE JUNEGRASS
LUZUL	LUZULA	WOODRUSH
MELIC	MELICA	ONIONGRASS
MEBU	MELICA BULBOSA	ONIONGRASS
MEFU	MELICA FUGAX	LITTLE ONIONGRASS
MESP	MELICA SPECTABILIS	SHOWY OR PURPLE ONIONGRASS
PHPR	PHLEUM PRATENSE	COMMON TIMOTHY
POA	POA	BLUEGRASS
POBU	POA BULBOSA	BULBOUS BLUEGRASS
POCU	POA CUSICKII	CUSICK'S BLUEGRASS
PONE	POA NERVOSA	WHEELER'S BLUEGRASS
POPR	POA PRATENSIS	KENTUCKY BLUEGRASS
POSA3	POA SANDBERGII	SANDBERG'S BLUEGRASS
PUCCI	PUCCINELLIA	ALKALIGRASS
SIHY	SITANION HYSTRIX	BOTTLEBRUSH SQUIRRELTAIL
SIHYH	SITANION HYSTRIX HORDEOIDES	DWARF SQUIRRELTAIL
SPCR	SPOROBOLUS CRYPTANDRUS	SAND DROPSEED
STLE	STIPA LETTERMANII	LETTERMAN'S NEEDLEGRASS
STOC	STIPA OCCIDENTALIS	WESTERN NEEDLEGRASS
TRSP	TRISETUM SPICATUM	SPIKE TRISETUM OR DOWNY OATGRASS

Forbs

ACMIL	ACHILLEA MILLEFOLIUM LANULOSA	COMMON YARROW
ACCO	ACONITUM COLUMBIANUM	COLUMBIA MONKSHOOD
ACRU	ACTAEA RUBRA	WILD RED BANEBERRY
ADBI	ADENOCAULON BICOLOR	TRAIL PLANT OR PATHFINDER
ADPE	*ADIANTUM PEDATUM*	*MAIDENHAIR FERN*
AGUR	AGASTACHE URTICIFOLIA	NETTLE LEAF HORSEMINT
AGOSE	AGOSERIS	FALSE DANDELION OR AGOSERIS
AGGL	AGOSERIS GLAUCA	PALE AGOSERIS
ALAC	ALLIUM ACUMINATUM	TAPERTIP ONION
ALTO	*ALLIUM TOLMIEI*	*TOLMIE'S ONION*
ALAL	ALYSSUM ALYSSOIDES	PALE ALYSSUM
AMSIN	AMSINKIA	FIDDLENECK
AMRE2	AMSINKIA RETRORSA	RIGID FIDDLENECK
ANMA	ANAPHALIS MARGARITACEA	COMMON PEARLY-EVERLASTING
ANPI	ANEMONE PIPERI	PIPER'S ANEMONE OR WINDFLOWER
ANTEN	ANTENNARIA	PUSSYTOES OR EVER

		-LASTING
ANAL	ANTENNARIA ALPINA	ALPINE PUSSYTOES OR EVERLASTING
ANDI	ANTENNARIA DIMORPHA	LOW PUSSYTOES
ANLU	ANTENNARIA LUZULOIDES	WOODRUSH PUSSYTOES
ANRO	ANTENNARIA ROSEA	ROSY PUSSYTOES
ANST	ANTENNARIA STENOPHYLLA	NARROW-LEAF PUSSYTOES
APANP	APOCYNUM ANDROSAEMIFOLIUM PUMILUM	SPREADING DOGBANE
AQFO	AQUILEGIA FORMOSA	RED OR SITKA COLUMBINE
ARAC	ARABIS ACULEOLATA	WALL ROCKCRESS
ARENA	ARENARIA	SANDWORT
ARCA2	ARENARIA CAPILLARIS	MOUNTAIN SANDWORT
ARCO2	ARENARIA CONGESTA	CAPITATE SANDWORT
ARMA3	ARENARIA MACROPHYLLA	BIGLEAF SANDWORT
ARCO	ARNICA CORDIFOLIA	HEARTLEAF ARNICA
ARFO	ARNICA FOLIOSA	LEAFY ARNICA
ARFU	ARNICA FULGENS	ORANGE ARNICA
ARSO	ARNICA SORORIA	TWIN ARNICA
ASCA3	ASARUM CAUDATUM	WILD GINGER
ASTER	ASTER	ASTER
ASAL	ASTER ALPIGENUS	ALPINE ASTER
ASCA2	ASTER CAMPESTRIS	WESTERN MEADOW ASTER
ASCH	ASTER CHILENSIS	LONG-LEAVED ASTER
ASCO	ASTER CONSPICUUS	SHOWY ASTER
ASFOP	ASTER FOLIACEUS PARRYI	LEAFY ASTER
ASIN	ASTER INTEGRIFOLIUS	THICK-STEMMED OR STICKY ASTER
ASTRA	ASTRAGALUS	LOCOWEED OR MILKVETCH
ASFI	ASTRAGALUS FILIPES	BASALT MILKVETCH
ASRE	ASTRAGALUS REVENTUS	BLUE MOUNTAIN MILKVETCH
ATFI	ATHYRIUM FILIX-FEMINA	LADY FERN
BASA	BALSAMORHIZA SAGITTATA	ARROWLEAF BALSAMROOT
BASE	BALSAMORHIZA SERRATA	SERRATE OR TOOTHED BALSAMROOT
BERU	BESSEYA RUBRA	RED BESSEYA
BLSC	BLEPHARIPAPPUS SCABER	BLEPHARIPAPPUS
BRHI	BRASSICA HIRTA	WHITE MUSTARD
BRODI	BRODIAEA SPP.	BRODIEA OR WILD HYACINTH
CALOC	CALOCHORTUS	MARIPOSA OR SEGO LILY
CABU2	CALYPSO BULBOSA	CALYPSO OR FAIRY-SLIPPER
CAMAS	CAMASSIA	CAMAS
CACU	CAMASSIA CUSICKII	CUSICK'S CAMAS
CAQU	CAMASSIA QUAMASH	COMMON CAMAS
CABU	CAPSELLA BURSA-PASTORIS	SHEPHERD'S PURSE
CAPU2	CARDAMINE PULCHERRIMA	SLENDER TOOTHWORT
CASTI	CASTILLEJA	PAINTBRUSH
CAAR	CASTILLEJA ARACHNOIDEA	COBWEBBY OR COTTON PAINTBRUSH
CACU3	CASTILLEJA CUSICKII	CUSICK'S PAINTBRUSH
CAHI2	CASTILLEJA HISPIDA	HARSH PAINTBRUSH
CALI2	CASTILLEJA LINARIAEFOLIA	NARROW-LEAVED PAINTBRUSH
CEAR	CERASTIUM ARVENSE	FIELD CHICKWEED OR STARRY CERASTIUM
CIAL	CIRCAEA ALPINA	ENCHANTER'S NIGHTSHADE
CIRSI	CIRSIUM	THISTLE
CIUT	CIRSIUM UTAHENSE	UTAH THISTLE
CIVU	CIRSIUM VULGARE	COMMON OR BULL THISTLE
CLPU	CLARKIA PULCHELLA	PINK FAIRIES OR DEER HORN
CLLA	CLAYTONIA LANCEOLATA	WESTERN SPRINGBEAUTY

CLUN	CLINTONIA UNIFLORA	QUEEN'SCUP BEADLILY
COLLI	COLLINSIA	BLUE-EYED MARY
COPA	COLLINSIA PARVIFLORA	SMALL FLOWERED BLUE-EYED MARY
COLLO	COLLOMIA	COLLOMIA
COGR2	COLLOMIA GRANDIFLORA	LARGE-FLOWERED COLLOMIA
COLI2	COLLOMIA LINEARIS	NARROW-LEAVED COLLOMIA
COTE	COLLOMIA TENELLA	DIFFUSE COLLOMIA
COMA3	CORALLORHIZA MACULATA	PACIFIC OR SPOTTED CORALROOT
COCA	CORNUS CANADENSIS	BUNCHBERRY
CREPI	CREPIS	HAWKSBEARD
CRAC	CREPIS ACUMINATA	LONG-LEAVED OR TAPERTIP HAWKSBEARD
CROC	CREPIS OCCIDENTALIS	WESTERN HAWKSBEARD
CRAF	CRYPTANTHA AFFINIS	SLENDER CRYPTANHTA
CRAM	CRYPTANTHA AMBIGUA	OBSCURE CRYPTANTHA
CRIN2	CRYPTANTHA INTERMEDIA	COMMON CRYPTANTHA
CYMO	CYPRIPEDIUM MONTANUM	MT. LADY'S-SLIPPER
DELPH	DELPHINIUM	LARKSPUR OR DELPHINIUM
DEDE	DELPHINIUM DEPAUPERATUM	SLIM OR DWARF LARKSPUR
DEME	DELPHINIUM MENZIESII	MENZIES LARKSPUR
DESCU	DESCURAINIA	TANSYMUSTARD
DIHO	DISPORUM HOOKERI	HOOKER'S FAIRYBELLS
DITR	DISPORUM TRACHYCARPUM	WARTBERRY FAIRYBELLS
DODEC	DODECATHEON	SHOOTINGSTAR
DOCO	DODECATHEON CONJUGENS	SLIMPOD SHOOTINGSTAR
EPILO	EPILOBIUM	WILLOW-HERB OR WILLOW-WEED
EPAN	EPILOBIUM ANGUSTIFOLIUM	FIREWEED
EPMI	EPILOBIUM MINUTUM	SMALL-FLOWERED WILLOW-HERB
EPPA	EPILOBIUM PANICULATUM	TALL ANNUAL WILLOW-WEED
EQAR	EQUISETUM ARVENSE	COMMON HORSETAIL
ERIGE	ERIGERON	DAISY OR FLEABANE
ERBL	ERIGERON BLOOMERI	SCABLAND FLEABANE
ERCH	ERIGERON CHRYSOPSIDIS	DWARF YELLOW FLEABANE OR GOLDEN DAISY
ERCO	ERIGERON COMPOSITUS	CUT-LEAVED DAISY
ERCO3	ERIGERON CORYMBOSUS	FOOTHILL DAISY OR LONG-LEAF FLEABANE
EREA	ERIGERON EATONII	EATON'S DAISY
ERSP	ERIGERON SPECIOSUS	SHOWY FLEABANE
ERIOG	ERIOGONUM	BUCKWHEAT OR ERIOGONUM
ERFL	ERIOGONUM FLAVUM	GOLDEN BUCKWHEAT
ERHE	ERIOGONUM HERACLEOIDES	CREAMY OR WYETH'S BUCKWHEAT
ERUM	ERIOGONUM UMBELLATUM	SULFURFLOWER OR SULFUR BUCKWHEAT
ERLA	ERIOPHYLLUM LANATUM	COMMON ERIOPHYLLUM OR WOOLY SUNFLOWER
ERGR	ERYTHRONIUM GRANDIFLORUM	DOGTOOTH VIOLET
FRVEC	FRAGARIA VESCA CRINITA	WOODS STRAWBERRY
FRVIP	FRAGARIA VIRGINIANA PLATYPETALA	BROADPETAL STRAWBERRY
FRALN	FRASERA ALBICAULIS NITIDA	WHITE STEMMED FRASERA
FRSP	FRASERA SPECIOSA	GIANT FRASERA
FRPU	FRITILLARIA PUDICA	YELLOW BELLS
GALIU	GALIUM	BEDSTRAW
GAAP	GALIUM APARINE	CLEAVERS OR GOOSE-GRASS
GATR	GALIUM TRIFLORUM	SWEETSCENTED OR FRAGRANT

		BEDSTRAW
GEVI	GERANIUM VISCOSISSIMUM	STICKY GERANIUM
GEMA	GEUM MACROPHYLLUM	LARGELEAVED AVENS
GETR	GEUM TRIFLORUM	RED AVENS, OLD MAN'S WHISKERS OR PRAIRIE SMOKE
GILIA	GILIA	GILIA
GIAG	GILIA AGGREGATA	SCARLET GILIA OR SKYROCKET
GOOB	GOODYERA OBLONGIFOLIA	WESTERN RATTLESNAKE PLANTAIN
GRNA	GRINDELIA NANA	LOW GUMWEED
GRSQ	GRINDELIA SQUARROSA	RESIN-WEED
GYDR	GYMNOCARPIUM DRYOPTERIS	OAKFERN
HAEL	HABENARIA ELEGANS	CALIFORNIA HILLSIDE HABENARIA
HACA	HAPLOPAPPUS CARTHAMOIDES	LARGE-FLOWERED GOLDENWEED OR COLUMBIA GOLDENWEED
HALA	HAPLOPAPPUS LANUGINOSUS	WOOLY GOLDENWEED
HELIA	HELIANTHELLA	SUNFLOWER
HEPU	HESPEROCHIRON PUMILIS	DWARF HESPEROCHIRON
HECY	HEUCHERA CYLINDRICA	ROUNDLEAVED OR LAVA ALUMROOT
HEMI	HEUCHERA MICRANTHA	SMALL-FLOWERED ALUMROOT
HIERA	HIERACIUM	HAWKWEED
HIAL2	HIERACIUM ALBERTINUM	WESTERN HAWKWEED
HIAL	HIERACIUM ALBIFLORUM	WHITE-FLOWERED HAWKWEED
HILO	HIERACIUM LONGIBERBE	LONG-BEAKED HAWKWEED
HISC	HIERACIUM SCOULERI	WOOLYWEED
HOFU	HORKELIA FUSCA	TAWNY HORKELIA
HYCA	HYDROPHYLLUM CAPITATUM	WATERLEAF OR WOOLY BREECHES
HYFE	HYDROPHYLLUM FENDLERI	FENDLER'S WATERLEAF
HYGR	HYMENOXYS GRANDIFLORA	OLD-MAN-OF-THE-MOUNTAIN
IRIS	IRIS	IRIS
IRMI	IRIS MISSOURIENSIS	ROCKYMOUNTAIN IRIS
LASE	LACTUCA SERRIOLA	PRICKLY LETTUCE
LACO	LAPSANA COMMUNIS	NIPPLEWORT
LATHY	LATHYRUS	PEAVINE
LALA2	LATHYRUS LANSZWERTII	THICK-LEAVED PEAVINE
LANE	LATHYRUS NEVADENSIS	SIERRAN PEAVINE
LIGUS	LIGUSTICUM	LOVAGE OR LICORICE-ROOT
LICA2	LIGUSTICUM CANBYI	CANBY'S LOVAGE
LIFI	LIGUSTICUM FILICINUM	FERNLEAF LOVAGE
LICA3	LISTERA CAURINA	WESTERN OR NW TWAYBLADE
LITHO	LITHOPHRAGMA	FRINGECUP OR WOODLANDSTAR
LIBU	LITHOPHRAGMA BULBIFERA	BULBIFEROUS FRINGECUP
LIPA	LITHOPHRAGMA PARVIFLORA	SMALL-FLOWERED FRINGECUP
LIRU	LITHOSPERMUM RUDERALE	WAYSIDE GROMWELL
LOMAT	LOMATIUM	BISCUITROOT OR DESERT -PARSLEY
LOGO	LOMATIUM GORMANII	GORMAN BISCUITROOT
LOGR	LOMATIUM GRAYI	GRAY'S LOMATIUM
LOHE	LOMATIUM HENDERSONII	HENDERSON'S LOMATIUM
LOLE	LOMATIUM LEPTOCARPUM	SLENDERFRUIT LOMATIUM OR BICOLOR BISCUITROOT
LONU	LOMATIUM NUDICAULE	BARESTEM LOMATIUM
LOTR	LOMATIUM TRITERNATUM	NINE-LEAF LOMATIUM
LOMI	LOTUS MICRANTHUS	SMALL-FLOWERED DEERVETCH

LUPIN	LUPINUS	LUPINE
LUAR3	LUPINUS ARGENTEUS	SILVERY LUPINE
LUCA	LUPINUS CAUDATUS	TAILCUP LUPINE
LUHO	LUPINUS HOLOSERICEUS	LITTLE-FLOWERED LUPINE
LULET	LUPINUS LEUCOPHYLLUS TENUISPICUS	WOOLY OR VELVET LUPINE
LUSE	LUPINUS SERICEUS	SILKY LUPINE
MACI	MADIA CITRIODORA	LEMON-SCENTED TARWEED
MAGL	MADIA GLOMERATA	CLUSTER TARWEED
MAGR	MADIA GRACILIS	SLENDER OR COMMON TARWEED
MERTE	MERTENSIA	BLUEBELLS OR MERTENSIA
MEOB	MERTENSIA OBLONGIFOLIA	LEAFY BLUEBELLS
MITR	MICROSERIS TROXIMOIDES	FALSE AGOSERIS
MIGR	MICROSTERIS GRACILIS	PINK MICROSTERIS
MIST2	MITELLA STAUROPETALA	SIDE-FLOWERED MITREWORT
MONTI	MONTIA	MINER'S LETTUCE OR MONTIA
MOPA	MONTIA PARVIFOLIA	LITTLELEAVED MINER'S LETTUCE
NAIN	NAVARRETIA INTERTEXTA	NEEDLELEAVED NAVARRETIA
ORHI	ORTHOCARPUS HISPIDUS	HAIRY OWL-CLOVER
OSMOR	OSMORHIZA	SWEET-CICELY
OSCH	OSMORHIZA CHILENSIS	MOUNTAIN SWEET-CICELY
OSOC	OSMORHIZA OCCIDENTALIS	WESTERN SWEETROOT
PABR	PAEONIA BROWNII	BROWN'S PEONY
PEDIC	PEDICULARIS	LOUSEWORT OR PEDICULARIS
PEGR	PEDICULARIS GROENLANDICA	PINK ELEPHANTS OR ELEPHANT'S HEAD
PERA	PEDICULARIS RACEMOSA	LEAFY OR SICKLETOP LOUSEWORT
PENST	PENSTEMON	PENSTEMON OR BEARDTONGUE
PEDEV	PENSTEMON DEUSTUS VARIABILIS	HOT ROCK PENSTEMON
PEGA	PENSTEMON GAIRDNERI	GAIRDNER'S PENSTEMON
PEGL	PENSTEMON GLANDULOSUS	GLANDULAR OR STICKY-STEM PENSTEMON
PERY	PENSTEMON RYDBERGII	RYDBERG'S PENSTEMON
PEBO	PERIDERIDIA BOLANDERI	BOLANDER'S YAMPAH
PHACE	PHACELIA	PHACELIA
PHHE	PHACELIA HETEROPHYLLA	VARILEAF PHACELIA
PHLOX	PHLOX	PHLOX
PHPU	PHLOX PULVINATA	CUSHION PHLOX
PHCH	PHOENICAULIS CHEIRANTHOIDES	DAGGERPOD
POPUC	POLEMONIUM PULCHERRIMUM CALYCINUM	SKUNK-LEAVED POLEMONIUM OR JACOB'S LADDER
POLYG	POLYGONUM	KNOTWEED, POKEWEED OR FLEECEFLOWER
POBI	POLYGONUM BISTORTOIDES	AMERICAN OR WESTERN BISTORT
PODO	POLYGONUM DOUGLASII	DOUGLAS' KNOTWEED
POMA2	POLYGONUM MAJUS	WIRY OR PALOUSE KNOTWEED
POPH	POLYGONUM PHYTOLACCAEFOLIUM	ALPINE FLEECEFLOWER
POMU	POLYSTICHUM MUNITUM	SWORD FERN
POTEN	POTENTILLA	CINQUEFOIL OR FIVEFINGER
POGL	POTENTILLA GLANDULOSA	STICKY OR GLAND CINQUEFOIL
POGR	POTENTILLA GRACILIS	SLENDER CINQUEFOIL
PTAQ	PTERIDIUM AQUILINUM	BRAKEN OR BRAKE FERN
PYAS	PYROLA ASARIFOLIA	PINK WINTERGREEN
PYPI	PYROLA PICTA	WHITEVEIN WINTERGREEN
PYSE	PYROLA SECUNDA	SIDEBELLS PYROLA

RANUN	RANUNCULUS	BUTTERCUP OR CROWFOOT
RAPO	RANUNCULUS POPULAGO	BLUE MOUNTAIN BUTTERCUP
RUOC	RUDBECKIA OCCIDENTALIS	WESTERN CONEFLOWER
RUMEX	RUMEX	SORREL OR DOCK
RUAC	RUMEX ACETOSELLA	RED OR SHEEP SORREL
SASI	SANGUISORBA SITCHENSIS	SITKA BURNET
SCAN	SCUTELLARIA ANGUSTIFOLIA	NARROWLEAVED SKULLCAP
SELA2	SEDUM LANCEOLATUM	LANCELEAVED STONECROP
SELE	SEDUM LEIBERGII	LEIBERG'S STONECROP
SEST	SEDUM STENOPETALUM	WORMLEAF STONECROP
SENEC	SENECIO	GROUNDSEL OR BUTTERWEED OR RAGWORT
SECR	SENECIO CRASSULUS	THICK-LEAVED GROUNDSEL
SEIN	SENECIO INTEGERRIMUS	WESTERN GROUNDSEL
SESE	SENECIO SERRA	BUTTERWEED GROUNDSEL
SIOR	SIDALCEA OREGANA	OREGON CHECKER-MALLOW
SILEN	SILENE	CAMPION OR CATCHFLY OR SILENE
SIOR2	SILENE OREGANA	OREGON CATCHFLY
SIIN2	SISYRINCHIUM INFLATUM	GRASS-WIDOWS
SMILA	SMILACINA	SOLOMON'S SEAL
SMST	SMILACINA STELLATA	STARRY FALSE SOLOMON'S SEAL
SPRO	SPIRANTHES ROMANZOFFIANA	HOODED LADIES TRESSES OR PEARL-TWIST
SPRAG	SPRAGUEA	PUSSYPAWS
STRO	STREPTOPUS ROSEUS	ROSY TWISTEDSTALK
SYMI	SYNTHERIS MISSURICA	MOUNTAIN KITTENTAILS
TAOF	TARAXACUM OFFICINALE	COMMON DANDELION
THOC	THALICTRUM OCCIDENTALE	WESTERN MEADOWRUE
THMO	THERMOPSIS MONTANA	MOUNTAIN THERMOPSIS OR GOLDEN-PEA
TITRU	TIARELLA TRIFOLIATA UNIFOLIATA	COOLWORT FOAMFLOWER
TRAGO	TRAGOPOGON	SALSIFY OR GOATSBEARD
TRDU	TRAGOPOGON DUBIUS	YELLOW SALSIFY
TRCA3	TRAUTVETTERIA CAROLINIENSIS	FALSE BUGBANE
TRLA2	TRIENTALIS LATIFOLIA	WESTERN STARFLOWER
TRLO	TRIFOLIUM LONGIPES	LONG STALKED CLOVER
TRMA	TRIFOLIUM MACROCEPHALUM	BIG HEAD CLOVER
TRPL	TRIFOLIUM PLUMOSUM	PUSSY CLOVER
URTIC	URTICA	NETTLE
URDI	URTICA DIOICA	STINGING NETTLE
VASI	VALERIANA SITCHENSIS	SITKA VALERIAN
VECA	VERATRUM CALIFORNICUM	CALIFORNIA FALSE HELLEBORE
VIAM	VICIA AMERICANA	AMERICAN VETCH
VIOLA	VIOLA	VIOLET
VINUM	VIOLA NUTTALLII MAJOR	NUTTALL'S VIOLET
WOOR	WOODSIA OREGANA	OREGON WOODSIA
WYAM	WYETHIA AMPLEXICAULIS	NORTHERN MULE'S EARS
ZIPA	ZIGADENUS PANICULATUS	PANICLED DEATHCAMAS
ZIVEG	ZIGADENUS VENENOSUS GRAMINEUS	DEADLY ZIGADENUS OR MEADOW DEATHCAMAS

APPENDIX C. *Mean canopy coverage and constancy* of principal species*

SPECIES CODE	PLANT ASSOCIATION OR PLANT COMMUNITY TYPE				
	ABLA2/TRCA3 N=5	ABLA2/ARCO N=3	ABLA2/CLUN N=5	ABLA2/LIBO2 N=7	ABLA2/MEFE N=2
Trees					
ABGR	3/40	-	1/20	4/42	-
ABLA2	20/100	53/100	29/100	27/100	60/100
JUOC	-	-	-	-	-
LAOC	1/20	10/33	4/80	11/42	3/50
PIEN	30/100	9/100	23/100	30/100	13/100
PIAL	-	-	-	-	-
PICO	18/40	4/66	19/40	13/57	-
PIMO	-	-	-	-	-
PIPO	-	-	-	-	-
POTR2	1/20	-	-	-	-
PSME	-	-	10/20	-	-
Shrubs					
ACGL	2/20	-	1/20	-	-
ALRU	-	-	-	-	-
ALSI	4/40	-	5/20	2/14	-
ARNE	-	-	-	1/14	-
ARTRV	-	-	-	-	-
BERE	-	-	-	1/14	-
CELE	-	-	-	-	-
CHME	-	-	-	-	1/50
CHUM	2/40	-	2/80	7/71	3/50
CHVI	-	-	-	-	-
COST	1/20	-	-	-	-
HODI	-	-	-	-	-
LIBO2	3/20	-	2/20	11/100	-
LOIN	2/60	12/33	-	-	-
LOUT2	-	-	3/40	1/14	-
MEFE	-	-	-	-	28/100
PAMY	-	-	2/20	2/71	-
PHLE2	-	-	-	-	-
PHMA	-	-	-	-	-
PRUNU	-	-	-	-	-
PUTR	-	-	-	-	-
RICE	-	-	-	-	-
RILA	14/40	-	-	2/57	-
RIMO	-	-	-	-	-
RIVI	-	-	-	-	-
ROSA	-	-	-	-	-
ROGY	-	-	1/20	-	-
RUPA	-	2/33	-	-	-
SASC	1/20	-	-	-	-
SOSI	1/20	-	2/60	-	-
SPBE	-	-	-	-	-
SYAL	-	-	-	-	-
SYOR	-	-	-	-	-
TABR	-	-	-	-	-
VAME	5/40	2/66	31/100	9/71	28/100
VASC	11/40	-	2/40	23/85	-
Grasses & Grasslike					
AGSP	-	-	-	-	-
BRCA	-	-	-	-	-
BRVU	4/80	1/33	2/60	4/57	-
CARU	-	-	2/20	1/28	-
CACO	-	-	-	1/57	-
CAGE	-	-	-	1/14	-
CARO	-	-	-	-	-
ELGL	-	-	-	-	-
FEID	-	-	-	-	-
FEOC	-	-	-	1/14	-
KOCR	-	-	-	-	-
PONE	-	-	-	-	-
POSA3	-	-	-	-	-

APPENDIX C. (continued)

SPECIES CODE	PLANT ASSOCIATION OR PLANT COMMUNITY TYPE				
	ABLA2/TRCA3	ABLA2/ARCO	ABLA2/CLUN	ABLA2/LIBO2	ABLA2/MEFE
SIHY	-	-	-	-	-
STOC	2/20	-	-	1/14	-
Forbs					
ACMIL	1/20	-	-	1/14	-
ACCO	4/40	-	-	-	-
ACRU	-	-	-	-	-
ADBI	1/20	-	-	3/14	-
AGGL	-	-	-	-	-
ANPI	5/60	4/100	2/80	1/28	2/100
ANRO	-	-	-	-	-
ANST	-	-	-	-	-
AQFO	1/20	-	1/20	-	-
ARENA	-	-	-	-	-
ARMA3	4/60	-	1/40	1/14	-
ARCO	4/60	22/100	25/100	2/85	25/100
ASCA3	2/20	-	-	-	-
ASCO	-	-	1/20	-	-
ATFI	-	-	-	-	-
BASA	-	-	-	-	-
CLUN	8/20	-	14/100	-	-
CREPI	-	-	-	-	-
DIHO	1/20	-	-	-	-
DITR	4/20	-	1/20	-	-
EPAN	1/20	-	-	-	-
EREA	-	-	-	-	-
ERFL	-	-	-	-	-
ERHE	-	-	-	-	-
ERLA	-	-	-	-	-
ERGR	-	-	-	2/14	-
FRVEC	3/40	-	1/20	1/42	-
FRVIP	-	-	-	-	-
GALIU	2/60	2/33	1/20	1/28	-
GEVI	-	-	-	-	-
GETR	-	-	-	-	-
GOOB	1/40	-	1/40	1/28	4/100
GYDR	-	-	-	-	-
HIAL2	-	-	-	-	-
HIAL	1/40	-	1/80	2/42	-
HYCA	-	-	-	-	-
LICA3	-	-	1/40	-	1/50
LOMAT	-	-	-	-	-
LUAR3	-	-	-	-	-
LUCA	-	-	-	-	-
MIST2	2/20	3/66	1/20	1/71	1/50
OSCH	2/60	2/33	1/40	3/14	1/100
PERA	3/20	-	1/40	4/28	1/50
PENST	-	-	-	-	-
PHLOX	-	-	-	-	-
POPUC	2/60	2/66	14/60	1/14	1/100
POPH	-	-	-	-	-
POMU	-	-	-	-	-
PTAQ	-	15/33	1/20	-	-
PYAS	-	1/33	-	2/14	-
PYSE	4/80	3/33	1/60	3/71	18/100
SENEC	2/20	-	-	-	-
SMILA	2/60	-	1/20	-	-
SMST	-	-	-	-	-
THOC	8/80	-	2/60	1/28	2/100
TITRU	4/40	-	-	-	-
TRCA3	13/100	1/100	1/20	-	1/50
TRLA2	-	-	-	-	-
VASI	2/60	-	8/40	-	-
VECA	1/20	1/33	1/60	-	-
VIOLA	8/80	2/100	4/80	2/85	4/100

* Number to the left of slash (/) is % canopy coverage, to the right is % constancy.

APPENDIX C. Mean canopy coverage and constancy* of principal species

SPECIES CODE	PLANT ASSOCIATION OR PLANT COMMUNITY TYPE				
	ABLA2/VAME N=9	ABLA2/VASC N=6	PICO(ABLA2)/ VASC N=7	ABLA2/CAGE N=8	ABLA2/STOC N=4
Trees					
ABGR	2/22	5/16	4/28	-	-
ABLA2	40/100	31/100	7/100	19/100	38/100
JUOC	-	-	-	-	-
LAOC	7/55	4/50	7/14	-	-
PIEN	12/77	18/83	6/71	-	-
PIAL	-	2/16	-	19/75	1/25
PICO	6/55	10/66	31/100	9/37	9/100
PIMO	-	-	-	-	-
PIPO	-	-	-	-	-
POTR2	-	-	-	-	-
PSME	3/11	11/33	-	-	-
Shrubs					
ACGL	1/11	-	-	-	-
ALRU	-	-	-	-	-
ALSI	-	-	-	-	-
ARNE	1/11	-	2/42	-	-
ARTRV	-	-	-	3/12	2/50
BERE	-	-	-	-	-
CELE	-	-	-	-	-
CHME	-	-	-	-	-
CHUM	3/44	3/33	1/28	-	-
CHVI	-	-	-	-	1/25
COST	-	-	-	-	-
HODI	-	-	-	-	-
LIBO2	-	-	-	-	-
LOIN	1/11	3/16	-	-	-
LOUT2	-	-	-	-	-
MEFE	-	-	-	-	-
PAMY	1/11	3/50	2/57	-	-
PHLE2	-	-	-	-	-
PHMA	-	-	-	-	-
PRUNU	-	-	-	-	-
PUTR	-	-	-	-	-
RICE	-	-	-	-	-
RILA	-	1/16	-	-	-
RIMO	3/11	-	-	7/37	4/50
RIVI	-	-	-	-	-
ROSA	-	-	-	-	-
ROGY	-	-	-	-	-
RUPA	-	-	-	-	-
SASC	-	-	-	-	-
SOSI	-	-	-	-	-
SPBE	-	3/16	-	-	-
SYAL	3/11	1/16	1/14	-	1/25
SYOR	-	-	-	-	-
TABR	-	-	-	-	-
VAME	31/100	1/33	5/28	-	-
VASC	32/66	42/100	51/100	-	-
Grasses & Grasslike					
AGSP	-	-	-	-	-
BRCA	-	-	-	-	1/25
BRVU	1/22	-	-	-	-
CARU	-	6/33	1/14	-	-
CACO	3/11	1/16	2/28	-	-
CAGE	3/11	3/33	1/14	42/100	3/100
CARO	1/11	2/33	7/14	5/25	2/50
ELGL	-	-	-	-	-
FEID	-	-	-	-	-
FEOC	1/11	-	-	-	-
KOCR	-	-	-	-	-
PONE	-	-	-	4/25	-
POSA3	-	-	-	-	-

APPENDIX C. (continued)

SPECIES CODE	PLANT ASSOCIATION OR PLANT COMMUNITY TYPE				
	ABLA2/VAME	ABLA2/VASC	PICO(ABLA2)/ VASC	ABLA2/CAGE	ABLA2/STOC
SIHY	-	-	-	1/62	21/50
STOC	-	-	7/14	3/50	6/100
Forbs					
ACMIL	-	-	-	4/50	1/25
ACCO	-	-	-	-	-
ACRU	-	-	-	-	-
ADBI	20/11	-	-	-	-
AGGL	-	-	-	-	-
ANPI	3/44	-	1/14	-	1/25
ANRO	-	-	-	-	-
ANST	-	-	-	-	-
AQFO	-	-	-	1/12	7/25
ARENA	-	-	1/14	4/37	-
ARMA3	-	2/16	1/14	-	-
ARCO	10/77	7/33	4/85	3/12	-
ASCA3	-	-	-	-	-
ASCO	1/11	-	-	-	-
ATFI	-	-	-	-	-
BASA	-	-	-	-	-
CLUN	-	-	1/14	-	-
CREPI	-	-	-	2/12	-
DIHO	-	-	-	-	-
DITR	-	-	-	-	-
EPAN	-	-	-	-	-
EREA	-	-	-	-	1/25
ERFL	-	-	-	3/25	-
ERHE	-	-	-	-	-
ERLA	-	-	1/14	-	1/25
ERGR	-	-	-	-	-
FRVEC	7/11	3/16	1/28	-	-
FRVIP	2/33	3/66	3/14	-	-
GALIU	1/11	-	-	-	-
GEVI	-	-	-	1/12	-
GETR	-	-	-	-	-
GOOB	1/11	-	-	-	-
GYDR	-	-	-	-	-
HIAL2	-	-	-	6/37	1/25
HIAL	1/66	1/33	1/71	1/12	-
HYCA	-	-	-	-	-
LICA3	-	-	-	-	-
LOMAT	-	-	-	5/12	-
LUAR3	2/22	1/16	-	12/25	-
LUCA	-	-	-	-	-
MIST2	3/22	3/66	3/14	-	-
OSCH	-	2/66	-	-	1/50
PERA	1/33	-	1/14	1/12	-
PENST	-	2/16	-	2/25	1/50
PHLOX	-	-	-	8/75	3/25
POPUC	2/22	-	-	3/37	1/25
POPH	-	-	7/14	4/37	-
POMU	2/11	-	-	-	-
PTAQ	-	-	-	-	-
PYAS	-	-	-	-	-
PYSE	2/55	3/66	2/28	-	-
SENEC	-	-	-	5/12	-
SMILA	-	-	-	-	-
SMST	-	-	-	-	-
THOC	2/22	-	-	-	1/50
TITRU	-	-	-	-	-
TRCA3	-	-	-	-	-
TRLA2	-	-	-	-	-
VASI	3/22	1/33	-	2/12	-
VECA	1/22	-	-	-	1/25
VIOLA	2/66	4/33	-	-	2/50

APPENDIX C. Mean canopy coverage and constancy* of principal species

SPECIES CODE	PLANT ASSOCIATION OR PLANT COMMUNITY TYPE				
	ABGR/GYDR N=4	ABGR/POMU-ASCA3 N=14	ABGR/TRCA3 N=16	ABGR/TABR/CLUN N=11	ABGR/TABR/LIBO2 N=10
Trees					
ABGR	55/100	60/100	54/100	59/100	72/100
ABLA2	-	4/7	3/37	-	-
JUOC	-	-	-	-	-
LAOC	3/50	6/28	6/62	1/27	4/80
PIEN	9/75	6/28	14/93	10/81	10/60
PIAL	-	-	-	-	-
PICO	-	-	3/18	1/9	-
PIMO	-	-	1/6	-	12/20
PIPO	-	10/7	2/6	5/9	1/10
POTR2	-	8/7	-	-	-
PSME	10/50	14/42	5/25	7/54	10/60
Shrubs					
ACGL	13/100	9/100	3/31	2/27	7/10
ALRU	-	8/42	-	-	-
ALSI	5/25	5/7	1/6	1/9	-
ARNE	-	-	-	-	-
ARTRV	-	-	-	-	-
BERE	-	-	2/25	1/9	2/30
CELE	-	-	-	-	-
CHME	1/50	-	1/18	1/9	1/10
CHUM	-	2/14	2/43	4/81	3/50
CHVI	-	-	-	-	-
COST	-	2/28	1/6	-	-
HODI	-	4/64	1/6	1/9	-
LIBO2	1/25	19/71	5/31	23/90	21/60
LOIN	-	-	4/37	-	-
LOUT2	1/25	8/14	10/6	1/36	-
MEFE	-	-	-	-	-
PAMY	-	-	1/6	1/27	2/70
PHLE2	1/25	6/50	-	-	-
PHMA	-	2/35	-	-	-
PRUNU	-	-	-	-	-
PUTR	-	-	-	-	-
RICE	-	-	-	-	-
RILA	2/100	2/64	2/43	1/36	1/10
RIMO	-	-	-	-	-
RIVI	1/25	1/14	3/12	1/18	-
ROSA	-	-	-	-	-
ROGY	3/50	3/92	7/56	3/72	2/30
RUPA	22/75	6/85	2/43	1/18	3/10
SASC	-	1/7	-	3/9	-
SOSI	-	1/14	1/18	-	3/10
SPBE	-	2/28	3/25	-	-
SYAL	1/75	18/64	9/37	3/27	1/10
SYOR	-	-	-	-	-
TABR	20/75	5/35	3/43	23/100	7/100
VAME	8/50	7/28	5/93	16/72	4/80
VASC	-	-	-	-	2/30
Grasses & Grasslike					
AGSP	-	1/7	-	-	-
BRCA	-	1/7	-	-	-
BRVU	3/50	5/100	3/93	2/72	2/40
CARU	-	-	1/18	1/9	-
CACO	-	1/7	5/6	1/9	2/30
CAGE	-	-	3/12	1/18	1/20
CARO	-	-	1/12	1/9	4/10
ELGL	-	1/7	-	-	-
FEID	-	-	-	-	-
FEOC	-	-	5/6	-	-
KOCR	-	-	-	-	-
PONE	-	-	-	-	-
POSA3	-	-	-	-	-

APPENDIX C. (continued)

SPECIES CODE	PLANT ASSOCIATION OR PLANT COMMUNITY TYPE				
	ABGR/GYDR	ABGR/POMU-ASCA3	ABGR/TRCA3	ABGR/TABR/CLUN	ABGR/TABR/LIBO2
SIHY	-	-	-	-	-
STOC	-	1/7	1/12	-	1/10
Forbs					
ACMIL	-	-	1/6	-	-
ACCO	1/75	2/21	2/25	-	-
ACRU	4/75	2/71	3/37	2/27	1/20
ADBI	5/100	3/85	5/68	10/72	2/30
AGGL	-	-	-	-	-
ANPI	4/50	6/14	3/93	2/81	2/50
ANRO	-	-	-	-	-
ANST	-	-	-	-	-
AQFO	-	5/7	2/12	-	10/10
ARENA	-	-	-	-	-
ARMA3	-	-	2/50	2/18	-
ARCO	5/75	6/21	5/62	6/54	2/30
ASCA3	8/75	15/92	1/6	-	-
ASCO	-	2/14	2/12	2/9	-
ATFI	10/50	2/14	1/12	1/9	-
BASA	-	-	-	-	-
CLUN	9/100	10/100	4/62	12/100	-
CREPI	-	-	-	-	-
DIHO	37/75	31/85	2/18	35/9	-
DITR	-	4/14	4/62	1/36	2/20
EPAN	-	-	-	2/9	-
EREA	-	-	-	-	-
ERFL	-	-	-	-	-
ERHE	-	-	-	-	-
ERLA	-	-	-	-	-
ERGR	-	-	4/18	-	3/40
FRVEC	-	3/71	2/75	2/54	1/10
FRVIP	-	1/7	3/6	-	3/10
GALIU	3/75	3/78	3/81	1/54	1/30
GEVI	-	-	-	-	-
GETR	-	-	-	-	-
GOOB	1/75	1/57	1/43	1/45	2/50
GYDR	30/100	4/14	1/12	1/9	-
HIAL2	-	-	-	-	-
HIAL	-	2/35	2/75	1/45	1/60
HYCA	-	-	-	-	-
LICA3	-	-	-	-	-
LOMAT	-	-	-	-	-
LUAR3	-	-	5/6	-	1/10
LUCA	-	-	-	-	-
MIST2	4/25	2/21	2/68	2/63	3/60
OSCH	3/75	2/85	3/75	2/81	1/20
PERA	-	-	6/12	-	-
PENST	-	-	-	-	-
PHLOX	-	-	-	-	-
POPUC	-	1/14	3/50	1/27	2/20
POPH	-	-	-	-	-
POMU	7/50	12/85	-	-	-
PTAQ	-	-	9/18	2/18	2/20
PYAS	-	1/14	1/6	1/9	2/40
PYSE	1/25	1/14	3/56	1/45	4/40
SENEC	-	-	-	-	-
SMILA	1/25	11/42	3/81	4/36	10/30
SMST	12/75	18/57	-	7/36	-
THOC	1/50	4/35	5/100	5/72	2/20
TITRU	20/100	28/78	5/75	6/54	7/10
TRCA3	4/50	1/7	8/100	1/9	1/10
TRLA2	2/50	3/57	-	-	-
VASI	-	-	3/18	-	-
VECA	-	-	1/12	-	-
VIOLA	3/100	4/85	3/81	2/63	1/40

APPENDIX C. Mean canopy coverage and constancy* of principal species

SPECIES CODE	PLANT ASSOCIATION OR PLANT COMMUNITY TYPE				
	ABGR/ACGL N=8	ABGR/CLUN N=19	ABGR/LIBO2 N=39	PICO(ABGR)/ VAME-LIBO2 N=4	ABGR/VAME N=11
Trees					
ABGR	42/100	57/100	46/100	7/100	31/100
ABLA2	-	1/5	7/25	-	11/54
JUOC	-	-	-	-	-
LAOC	10/62	12/78	13/64	12/50	11/72
PIEN	18/50	10/68	15/61	7/25	19/36
PIAL	-	-	-	-	-
PICO	-	-	8/38	50/100	4/27
PIMO	20/12	26/5	9/12	-	-
PIPO	8/12	5/5	4/12	-	22/27
POTR2	-	-	-	-	-
PSME	17/62	16/47	10/69	3/25	9/63
Shrubs					
ACGL	10/100	2/21	4/17	-	1/9
ALRU	-	-	-	-	-
ALSI	1/12	1/5	4/5	-	-
ARNE	-	-	8/10	3/75	1/9
ARTRV	-	-	-	-	-
BERE	-	2/10	2/25	2/50	1/9
CELE	-	-	-	-	1/9
CHME	-	1/36	-	-	-
CHUM	2/50	2/57	3/82	11/75	3/81
CHVI	-	-	-	-	-
COST	1/12	-	2/2	-	-
HODI	1/25	-	2/5	-	-
LIBO2	6/50	8/52	12/100	7/100	-
LOIN	7/37	1/5	1/10	-	-
LOUT2	1/25	1/5	3/5	-	-
MEFE	-	-	-	-	-
PAMY	3/62	1/36	2/46	2/75	2/54
PHLE2	2/12	1/10	1/2	-	-
PHMA	12/12	1/5	2/7	-	-
PRUNU	-	-	-	-	-
PUTR	-	-	-	-	-
RICE	-	1/10	3/2	-	-
RILA	2/37	3/31	2/10	-	-
RIMO	-	-	-	-	1/9
RIVI	2/25	2/5	3/7	-	1/9
ROSA	-	-	-	-	-
ROGY	4/87	2/78	4/64	1/25	1/36
RUPA	5/62	1/15	3/12	-	1/9
SASC	-	1/5	4/5	3/25	2/18
SOSI	1/25	2/31	2/5	-	-
SPBE	6/12	1/15	6/33	-	4/27
SYAL	7/37	3/42	4/23	2/25	2/27
SYOR	-	-	-	-	-
TABR	1/12	1/15	2/7	-	-
VAME	7/100	9/89	19/89	32/100	36/100
VASC	-	6/5	18/30	15/75	16/27
Grasses & Grasslike					
AGSP	-	-	-	-	-
BRCA	2/12	-	-	-	-
BRVU	2/87	2/89	3/41	1/25	1/9
CARU	5/25	2/15	5/25	48/75	9/36
CACO	1/12	1/5	3/35	3/50	1/36
CAGE	3/37	2/21	5/28	3/50	4/45
CARO	-	1/15	1/7	-	2/9
ELGL	-	-	-	-	-
FEID	-	-	-	-	-
FEOC	3/12	1/15	2/15	1/25	2/18
KOCR	-	-	-	-	-
PONE	-	-	-	-	-
POSA3	-	-	-	-	-

APPENDIX C. (continued)

SPECIES CODE	PLANT ASSOCIATION OR PLANT COMMUNITY TYPE				
	ABGR/ACGL	ABGR/CLUN	ABGR/LIBO2	PICO(ABGR)/ VAME-LIBO2	ABGR/VAME
SIHY	-	-	-	-	-
STOC	2/25	-	1/2	-	-
Forbs					
ACMIL	1/25	-	2/2	-	1/9
ACCO	1/12	-	-	-	-
ACRU	3/37	1/5	1/5	-	3/9
ADBI	4/50	5/78	2/20	-	11/18
AGGL	-	-	-	-	-
ANPI	2/75	3/57	2/46	3/50	2/27
ANRO	-	-	-	-	1/16
ANST	-	-	-	-	-
AQFO	1/25	2/10	1/2	-	-
ARENA	-	-	-	-	-
ARMA3	1/25	3/31	2/7	-	1/18
ARCO	6/100	7/52	7/48	3/50	11/72
ASCA3	1/12	-	-	-	-
ASCO	1/37	-	6/7	-	2/9
ATFI	1/25	-	-	-	-
BASA	-	-	-	-	-
CLUN	4/75	5/100	3/10	-	1/9
CREPI	-	-	-	-	-
DIHO	9/50	2/10	-	-	-
DITR	2/37	5/31	2/5	-	3/9
EPAN	1/12	-	1/2	-	-
EREA	-	-	-	-	-
ERFL	-	-	-	-	-
ERHE	-	-	-	-	-
ERLA	-	-	-	-	-
ERGR	-	-	7/12	-	-
FRVEC	2/75	3/42	2/43	-	2/18
FRVIP	1/25	-	1/10	3/25	-
GALIU	3/87	3/84	1/25	1/25	1/9
GEVI	-	-	-	-	-
GETR	-	-	-	1-25	-
GOOB	2/37	1/47	1/53	-	3/45
GYDR	-	1/5	3/5	-	-
HIAL2	-	-	-	-	-
HIAL	2/50	2/68	2/48	1/50	2/36
HYCA	-	-	-	-	-
LICA3	-	-	-	-	-
LOMAT	-	-	-	-	-
LUAR3	-	4/10	2/5	-	3/9
LUCA	-	-	3/2	-	-
MIST2	9/62	2/89	3/53	3/25	2/54
OSCH	3/62	2/84	2/28	-	1/9
PERA	1/12	1/5	2/7	-	-
PENST	5/12	-	-	-	-
PHLOX	-	-	-	-	-
POPUC	1/12	2/36	1/5	-	1/9
POPH	-	-	-	-	-
POMU	1/12	1/5	-	-	-
PTAQ	2/37	2/21	-	-	-
PYAS	2/37	1/26	2/28	-	1/9
PYSE	2/62	2/68	2/64	2/50	3/54
SENEC	-	-	-	-	-
SMILA	3/62	3/73	4/25	1/25	2/9
SMST	20/12	7/15	5/2	-	-
THOC	4/87	5/52	3/41	1/25	3/18
TITRU	5/37	3/63	2/12	-	1/9
TRCA3	-	1/26	2/12	-	1/9
TRLA2	-	2/5	3/5	-	-
VASI	-	1/5	4/2	-	-
VECA	-	-	-	-	-
VIOLA	2/75	2/68	2/48	3/50	2/27

* Number to the left of slash (/) is % canopy coverage, to the right is % constancy.

APPENDIX C. Mean canopy coverage and constancy* of principal species

SPECIES CODE	PLANT ASSOCIATION OR PLANT COMMUNITY TYPE				
	PICO(ABGR)/ VAME/CARU N=6	ABGR/VASC-LIBO2 N=14	ABGR/VASC N=13	PICO(ABGR)/ VASC/CARU N=16	ABGR/SPBE N=9
Trees					
ABGR	8/50	41/100	31/100	7/56	22/100
ABLA2	-	4/28	7/7	1/18	-
JUOC	-	-	-	-	-
LAOC	3/66	8/85	10/84	3/62	14/44
PIEN	-	25/50	3/7	4/25	-
PIAL	-	1/7	-	-	-
PICO	46/100	3/78	5/84	48/100	1/11
PIMO	-	25/7	-	-	-
PIPO	2/33	2/14	8/61	-	23/77
POTR2	-	-	-	-	-
PSME	8/50	9/71	15/76	2/18	26/100
Shrubs					
ACGL	-	1/7	-	-	1/11
ALRU	-	-	-	-	-
ALSI	-	-	-	-	-
ARNE	1/50	7/42	6/76	5/37	8/33
ARTRV	-	-	-	-	-
BERE	3/16	1/28	1/38	2/25	1/33
CELE	-	-	-	-	-
CHME	-	-	-	-	1/11
CHUM	4/50	6/71	5/61	6/50	2/55
CHVI	-	-	-	-	-
COST	-	-	-	-	-
HODI	-	-	-	-	8/11
LIBO2	-	7/100	-	3/25	1/11
LOIN	-	-	-	1/6	-
LOUT2	-	-	-	-	-
MEFE	-	-	-	-	-
PAMY	3/83	2/57	2/61	3/50	2/44
PHLE2	-	-	-	-	-
PHMA	-	-	-	-	-
PRUNU	-	-	-	-	-
PUTR	-	-	-	-	-
RICE	-	-	-	-	1/11
RILA	-	3/14	2/15	1/6	-
RIMO	-	-	-	-	-
RIVI	-	-	-	-	-
ROSA	-	-	-	-	-
ROGY	-	2/14	2/15	1/25	4/44
RUPA	-	1/14	-	-	-
SASC	2/33	1/7	2/23	1/6	2/55
SOSI	-	-	-	-	-
SPBE	5/50	2/21	8/46	3/18	10/100
SYAL	1/16	-	1/30	-	9/44
SYOR	-	-	-	-	-
TABR	-	-	-	-	-
VAME	36/100	3/42	2/38	5/31	6/44
VASC	16/66	18/100	27/100	45/100	2/22
Grasses & Grasslike					
AGSP	-	-	-	-	-
BRCA	-	-	1/7	-	-
BRVU	-	1/28	2/7	-	3/22
CARU	25/100	18/71	19/84	23/87	38/100
CACO	6/66	2/85	4/53	2/43	5/33
CAGE	2/33	4/42	5/61	5/50	7/66
CARO	-	10/7	-	-	1/11
ELGL	-	-	-	-	-
FEID	-	-	-	-	-
FEOC	1/16	2/28	2/15	2/12	1/11
KOCR	-	-	-	-	-
PONE	-	-	1/7	-	1/11
POSA3	-	-	-	-	-

APPENDIX C. (continued)

SPECIES CODE	PLANT ASSOCIATION OR PLANT COMMUNITY TYPE				
	PICO(ABGR)/ VAME/CARU	ABGR/VASC-LIBO2	ABGR/VASC	PICO(ABGR)/ VASC/CARU	ABGR/SPBE
SIHY	-	-	-	-	-
STOC	-	1/7	-	-	-
Forbs					
ACMIL	1/16	2/14	1/30	1/25	1/11
ACCO	-	-	-	-	-
ACRU	-	-	-	-	-
ADBI	-	-	-	-	1/11
AGGL	1/16	1/7	-	-	-
ANPI	-	2/21	-	2/6	2/11
ANRO	-	-	1/7	1/6	1/11
ANST	-	-	1/7	-	-
AQFO	-	2/7	-	-	-
ARENA	-	-	-	-	-
ARMA3	-	1/21	3/7	1/6	2/33
ARCO	3/16	5/57	5/53	4/31	9/77
ASCA3	-	-	-	-	-
ASCO	-	-	-	-	-
ATFI	-	-	-	-	-
BASA	-	-	-	-	-
CLUN	-	-	-	-	-
CREPI	-	-	-	-	-
DIHO	-	-	-	-	-
DITR	-	-	-	-	-
EPAN	-	1/14	1/23	3/43	1/11
EREA	-	-	-	-	-
ERFL	-	-	-	-	-
ERHE	-	-	-	-	-
ERLA	-	-	-	-	-
ERGR	-	-	1/23	1/18	1/11
FRVEC	1/16	2/50	2/46	5/31	2/33
FRVIP	5/50	2/42	2/46	2/50	5/55
GALIU	1/33	1/7	-	-	3/11
GEVI	-	1/7	1/15	-	-
GETR	-	-	-	-	-
GOOB	1/16	2/50	1/15	1/6	-
GYDR	-	-	-	-	-
HIAL2	2/16	-	1/7	-	2/22
HIAL	2/66	3/78	3/61	1/43	1/77
HYCA	-	-	-	-	-
LICA3	-	-	-	-	-
LOMAT	-	-	-	-	-
LUAR3	33/16	3/21	4/7	12/31	-
LUCA	11/33	2/14	2/23	4/18	2/33
MIST2	1/16	2/28	3/23	2/18	1/22
OSCH	2/33	2/35	2/7	1/25	2/33
PERA	-	2/7	1/7	1/6	-
PENST	-	-	-	1/6	-
PHLOX	-	-	-	-	-
POPUC	-	-	-	-	-
POPH	-	-	-	-	-
POMU	-	-	-	-	-
PTAQ	-	-	-	-	-
PYAS	-	1/7	-	-	-
PYSE	1/50	3/71	3/30	1/18	-
SENEC	-	-	-	-	-
SMILA	1/16	1/7	-	-	1/33
SMST	-	-	-	-	-
THOC	-	1/7	-	1/6	-
TITRU	-	-	-	-	-
TRCA3	-	-	-	-	-
TRLA2	-	-	-	-	-
VASI	-	-	-	-	-
VECA	2/16	-	-	-	-
VIOLA	-	2/50	2/23	1/25	4/11

APPENDIX C. Mean canopy coverage and constancy* of principal species

SPECIES CODE	PLANT ASSOCIATION OR PLANT COMMUNITY TYPE				
	ABGR/CARU N=26	PICO(ABGR)/ CARU N=5	ABGR/ARCO N=10	ABGR/CAGE N=10	ABGR/BRVU N=4
Trees					
ABGR	21/100	6/60	48/100	41/100	43/100
ABLA2	-	-	-	-	2/25
JUOC	1/7	-	1/10	-	-
LAOC	8/46	2/40	1/20	3/20	10/75
PIEN	-	-	-	-	7/50
PIAL	-	-	-	-	-
PICO	13/19	73/100	1/10	9/20	-
PIMO	-	-	-	-	-
PIPO	30/96	4/40	21/90	18/70	1/25
POTR2	-	-	-	-	-
PSME	11/84	4/40	20/100	11/90	9/75
Shrubs					
ACGL	-	-	-	-	3/25
ALRU	-	-	-	-	-
ALSI	-	-	-	-	-
ARNE	4/19	-	15/10	7/10	-
ARTRV	-	-	-	-	-
BERE	2/50	-	1/50	3/30	-
CELE	-	-	-	2/10	-
CHME	-	-	-	-	-
CHUM	3/15	1/20	4/10	3/40	-
CHVI	-	-	-	-	-
COST	-	-	-	-	-
HODI	-	-	-	-	1/25
LIBO2	-	-	-	-	-
LOIN	1/3	-	-	-	-
LOUT2	-	-	-	-	-
MEFE	-	-	-	-	-
PAMY	2/15	1/20	-	3/10	1/50
PHLE2	-	-	-	-	-
PHMA	-	-	-	-	-
PRUNU	-	-	1/10	2/20	-
PUTR	1/3	-	-	-	-
RICE	-	-	1/10	1/10	1/25
RILA	-	-	1/10	1/10	1/75
RIMO	-	-	-	-	-
RIVI	3/3	-	1/10	-	7/25
ROSA	-	-	-	-	-
ROGY	2/19	-	-	1/30	-
RUPA	1/3	-	-	-	-
SASC	-	-	-	1/10	-
SOSI	-	-	-	-	-
SPBE	2/7	-	-	-	-
SYAL	1/42	1/20	1/30	3/60	1/25
SYOR	-	-	-	-	-
TABR	-	-	-	-	-
VAME	5/3	3/20	-	-	3/25
VASC	5/7	2/20	1/10	-	1/50
Grasses & Grasslike					
AGSP	-	-	-	-	-
BRCA	-	-	-	2/10	-
BRVU	1/15	1/20	3/30	1/10	21/100
CARU	38/100	34/100	4/80	3/70	20/25
CACO	3/19	-	2/20	-	-
CAGE	13/92	2/60	11/100	25/100	4/75
CARO	2/7	2/40	2/30	1/10	4/25
ELGL	1/3	-	-	-	-
FEID	-	-	-	-	-
FEOC	1/26	1/20	1/30	1/10	1/50
KOCR	1/7	-	-	-	-
PONE	1/23	-	-	4/10	-
POSA3	-	-	-	-	-

APPENDIX C. (continued)

SPECIES CODE	PLANT ASSOCIATION OR PLANT COMMUNITY TYPE				
	ABGR/CARU	PICO(ABGR)/ CARU	ABGR/ARCO	ABGR/CAGE	ABGR/BRVU
SIHY	1/3	-	-	-	-
STOC	2/11	-	1/10	1/20	-
Forbs					
ACMIL	2/61	2/60	1/30	2/30	1/25
ACCO	-	-	-	-	-
ACRU	-	-	-	-	-
ADBI	1/3	-	-	-	1/25
AGGL	1/11	-	1/10	-	-
ANPI	-	-	-	1/20	3/25
ANRO	1/11	-	1/10	-	-
ANST	-	-	-	-	-
AQFO	-	-	3/20	-	1/75
ARENA	-	-	-	-	-
ARMA3	1/3	-	3/20	4/50	-
ARCO	7/57	3/80	25/100	2/40	4/75
ASCA3	-	-	-	-	-
ASCO	-	-	-	-	-
ATFI	-	-	-	-	-
BASA	1/3	-	-	-	-
CLUN	-	-	-	-	1/25
CREPI	1/3	-	-	1/10	-
DIHO	-	-	-	-	-
DITR	-	-	-	-	-
EPAN	1/23	-	1/10	1/10	-
EREA	-	-	-	-	-
ERFL	-	-	-	-	-
ERHE	7/3	-	-	-	-
ERLA	-	-	-	1/10	-
ERGR	-	-	-	-	-
FRVEC	2/38	3/60	3/70	3/30	3/75
FRVIP	3/30	2/60	1/10	3/10	2/50
GALIU	1/19	-	1/30	1/10	5/75
GEVI	1/11	-	7/30	-	-
GETR	-	1/20	-	3/10	-
GOOB	1/3	-	-	1/30	-
GYDR	-	-	-	-	-
HIAL2	3/53	1/20	1/40	2/20	-
HIAL	2/57	1/80	2/50	2/50	2/75
HYCA	-	-	-	1/10	-
LICA3	-	-	-	-	-
LOMAT	-	-	-	-	-
LUAR3	4/23	4/40	8/20	-	21/50
LUCA	4/46	3/40	4/60	3/30	-
MIST2	1/7	-	1/40	1/10	4/100
OSCH	1/23	1/40	3/50	4/20	4/75
PERA	-	-	-	-	1/25
PENST	1/3	-	1/10	2/20	-
PHLOX	-	-	-	-	-
POPUC	-	-	-	-	11/50
POPH	-	-	-	-	-
POMU	-	-	-	-	-
PTAQ	-	-	-	-	-
PYAS	-	-	-	-	-
PYSE	1/11	-	2/30	2/30	2/75
SENEC	-	-	-	-	-
SMILA	1/7	-	1/10	2/20	2/50
SMST	-	-	-	-	-
THOC	1/7	-	6/20	1/10	1/25
TITRU	-	-	-	-	-
TRCA3	-	-	-	1/10	-
TRLA2	-	-	-	-	-
VASI	-	-	1/10	-	-
VECA	-	-	-	-	-
VIOLA	1/15	1/20	2/10	1/20	1/50

APPENDIX C. Mean canopy coverage and constancy* of principal species

SPECIES CODE	PLANT ASSOCIATION OR PLANT COMMUNITY TYPE				
	PICO/CARU N=8	PSME/PHMA N=19	PSME/HODI N=8	PSME/SYAL N=29	PSME/VAME N=5
Trees					
ABGR	1/37	1/15	3/25	1/20	4/20
ABLA2	1/12	-	-	-	-
JUOC	-	-	-	2/24	-
LAOC	6/12	8/26	14/25	8/13	5/40
PIEN	-	-	-	-	-
PIAL	-	-	-	-	-
PICO	61/100	-	-	8/6	-
PIMO	-	-	-	-	-
PIPO	5/12	16/57	23/100	22/96	17/100
POTR2	-	-	2/25	-	-
PSME	3/25	37/100	30/100	30/100	27/100
Shrubs					
ACGL	-	5/26	4/62	-	-
ALRU	-	-	-	-	-
ALSI	-	1/5	-	1/3	-
ARNE	8/25	-	-	5/17	4/40
ARTRV	-	-	-	-	-
BERE	2/25	2/42	2/37	3/72	3/20
CELE	-	-	-	5/3	1/20
CHME	-	-	-	-	-
CHUM	1/12	-	-	-	-
CHVI	-	-	-	-	-
COST	-	2/5	2/12	-	-
HODI	-	5/42	28/100	3/27	-
LIBO2	1/12	1/5	-	1/3	-
LOIN	-	-	2/12	-	-
LOUT2	-	-	-	-	-
MEFE	-	-	-	-	-
PAMY	-	-	-	-	2/20
PHLE2	-	-	3/25	3/6	-
PHMA	-	46/100	4/50	-	-
PRUNU	-	5/26	-	3/17	-
PUTR	-	-	-	1/3	-
RICE	-	-	-	1/31	-
RILA	-	-	-	1/3	-
RIMO	-	-	-	-	-
RIVI	-	-	3/12	-	-
ROSA	-	-	3/12	4/6	-
ROGY	-	5/73	2/62	2/65	1/100
RUPA	-	-	3/12	-	-
SASC	1/12	4/26	3/12	-	1/20
SOSI	-	1/5	-	-	-
SPBE	1/12	5/73	7/75	7/62	3/100
SYAL	3/25	13/94	29/100	28/100	20/20
SYOR	-	2/15	5/12	12/10	-
TABR	-	-	-	-	-
VAME	2/12	2/10	5/12	-	36/100
VASC	30/50	-	-	-	-
Grasses & Grasslike					
AGSP	-	3/21	1/12	8/6	-
BRCA	-	5/31	1/12	9/13	-
BRVU	1/12	2/21	2/75	3/3	-
CARU	25/100	16/89	7/50	13/55	35/100
CACO	2/25	2/21	-	3/6	2/60
CAGE	18/62	11/100	9/62	21/79	4/100
CARO	2/37	-	-	3/6	-
ELGL	-	2/10	1/37	6/41	-
FEID	-	-	-	1/10	-
FEOC	1/25	2/21	2/62	3/24	1/20
KOCR	-	-	-	-	-
PONE	3/12	4/21	1/12	2/17	-
POSA3	-	-	-	2/6	-

APPENDIX C. (continued)

SPECIES CODE	PLANT ASSOCIATION OR PLANT COMMUNITY TYPE				
	PICO/CARU	PSME/PHMA	PSME/HODI	PSME/SYAL	PSME/VAME
SIHY	-	-	-	1/3	-
STOC	-	2/15	2/25	3/27	1/20
Forbs					
ACMIL	1/62	2/52	2/25	2/79	1/20
ACCO	-	-	-	-	-
ACRU	-	-	-	-	-
ADBI	-	-	5/12	-	-
AGGL	-	1/5	-	1/10	-
ANPI	-	2/26	3/75	2/10	-
ANRO	1/37	-	-	1/6	-
ANST	1/12	-	-	1/10	-
AQFO	-	2/5	1/12	2/17	-
ARENA	-	-	-	-	-
ARMA3	-	2/5	2/50	6/10	-
ARCO	3/37	6/63	6/50	5/62	7/20
ASCA3	-	-	1/12	-	-
ASCO	2/12	4/15	-	5/20	-
ATFI	-	-	-	-	-
BASA	-	1/5	-	1/17	-
CLUN	-	-	6/12	1/6	-
CREPI	-	1/5	1/12	2/3	-
DIHO	-	-	25/12	-	-
DITR	-	6/10	2/12	2/3	-
EPAN	1/75	10/5	-	2/6	-
EREA	-	-	-	1/6	-
ERFL	-	-	-	-	-
ERHE	-	1/5	-	5/3	-
ERLA	-	-	-	-	-
ERGR	-	2/21	-	4/13	-
FRVEC	2/62	2/68	2/62	3/55	3/20
FRVIP	3/75	3/21	2/25	3/55	2/40
GALIU	-	2/31	1/50	2/27	-
GEVI	1/12	1/10	-	2/17	-
GETR	1/12	3/10	-	1/13	-
GOOB	-	-	1/12	-	2/20
GYDR	-	-	-	-	-
HIAL2	-	2/10	-	1/34	1/20
HIAL	-	2/21	2/50	2/6	2/60
HYCA	-	-	-	1/3	-
LICA3	-	-	-	-	-
LOMAT	-	2/5	-	1/6	-
LUAR3	11/37	-	-	2/6	-
LUCA	4/25	2/15	-	5/34	1/60
MIST2	1/12	4/36	1/12	1/6	1/20
OSCH	1/12	2/21	1/50	1/13	-
PERA	-	-	-	-	-
PENST	-	1/5	-	1/6	-
PHLOX	-	-	-	-	-
POPUC	-	-	-	-	-
POPH	-	-	-	-	-
POMU	-	-	4/25	-	-
PTAQ	-	-	3/62	-	20/20
PYAS	-	-	-	-	-
PYSE	1/12	-	1/12	-	-
SENEC	-	7/5	-	1/3	-
SMILA	-	2/36	12/12	1/17	-
SMST	-	-	30/12	-	-
THOC	1/37	1/10	3/12	3/27	-
TITRU	-	-	-	-	-
TRCA3	-	-	-	-	-
TRLA2	-	-	5/12	-	-
VASI	-	-	-	1/3	-
VECA	-	-	-	1/10	-
VIOLA	2/87	3/10	1/50	3/17	1/20

* Number to the left of slash (/) is # species occurrences, to the right is # sample

APPENDIX C. Mean canopy coverage and constancy* of principal species

SPECIES CODE	PLANT ASSOCIATION OR PLANT COMMUNITY TYPE				
	PSME/SYOR N=4	PSME/CARU N=24	PSME/CAGE N=7	PIPO/SYAL N=16	PIPO/SYOR N=10
Trees					
ABGR	-	2/37	3/28	1/12	-
ABLA2	-	-	-	-	-
JUOC	2/50	1/16	-	3/25	4/80
LAOC	-	3/16	6/14	3/6	-
PIEN	-	-	-	-	-
PIAL	-	-	-	-	-
PICO	-	4/8	-	-	-
PIMO	-	-	-	-	-
PIPO	18/75	34/95	30/100	35/100	39/100
POTR2	-	-	-	-	-
PSME	23/100	27/100	36/100	2/37	-
Shrubs					
ACGL	-	-	-	-	-
ALRU	-	-	-	-	-
ALSI	-	-	-	-	-
ARNE	-	7/16	2/14	1/6	-
ARTRV	-	-	-	1/6	1/10
BERE	5/75	2/66	2/71	2/37	-
CELE	-	2/20	2/14	-	3/40
CHME	-	-	-	-	-
CHUM	-	-	-	-	-
CHVI	-	-	-	1/18	1/10
COST	-	-	-	-	-
HODI	2/25	-	-	5/18	-
LIBO2	-	-	-	-	-
LOIN	-	-	-	-	-
LOUT2	-	-	-	-	-
MEFE	-	-	-	-	-
PAMY	1/50	1/16	-	-	-
PHLE2	-	-	-	-	-
PHMA	-	-	-	1/6	-
PRUNU	12/75	-	1/14	1/12	2/20
PUTR	-	2/8	-	7/6	1/20
RICE	3/75	1/4	4/28	6/25	4/40
RILA	-	1/4	-	-	-
RIMO	-	-	-	-	-
RIVI	2/25	-	-	-	-
ROSA	-	-	-	6/56	-
ROGY	3/25	2/41	1/42	-	-
RUPA	-	-	-	-	-
SASC	-	1/8	-	1/6	-
SOSI	-	-	-	-	-
SPBE	-	2/33	2/42	8/50	-
SYAL	-	2/70	2/42	32/100	1/10
SYOR	20/100	3/4	-	15/6	22/100
TABR	-	-	-	-	-
VAME	-	-	-	3/6	-
VASC	-	1/4	-	-	-
Grasses & Grasslike					
AGSP	-	-	-	20/6	15/20
BRCA	1/25	1/4	1/14	4/37	2/50
BRVU	-	-	-	5/6	-
CARU	17/75	42/100	2/42	27/56	50/20
CACO	-	4/33	4/28	1/6	-
CAGE	26/75	14/95	34/100	13/93	30/100
CARO	2/25	3/8	5/28	-	1/10
ELGL	-	1/4	-	5/37	-
FEID	5/25	-	6/14	10/25	10/30
FEOC	1/25	1/29	3/28	4/12	-
KOCR	-	1/8	-	7/6	3/10
PONE	10/25	2/29	4/71	5/31	1/30
POSA3	5/25	-	-	4/12	3/10

APPENDIX C. (continued)

SPECIES CODE	PLANT ASSOCIATION OR PLANT COMMUNITY TYPE				
	PSME/SYOR	PSME/CARU	PSME/CAGE	PIPO/SYAL	PIPO/SYOR
SIHY	11/50	1/12	-	-	1/30
STOC	3/25	1/12	-	3/25	1/50
Forbs					
ACMIL	1/50	2/66	2/57	2/68	4/50
ACCO	-	-	-	-	-
ACRU	-	-	-	-	-
ADBI	-	-	-	-	-
AGGL	-	1/8	-	2/18	-
ANPI	-	-	-	3/6	-
ANRO	-	1/12	-	1/6	3/10
ANST	-	-	2/28	1/6	1/10
AQFO	-	1/4	-	1/6	3/10
ARENA	-	-	-	-	-
ARMA3	-	1/4	-	10/6	-
ARCO	8/75	7/75	5/57	7/43	5/20
ASCA3	-	-	-	-	-
ASCO	-	-	-	-	1/10
ATFI	-	-	-	-	-
BASA	-	1/4	-	-	1/20
CLUN	-	-	-	-	-
CREPI	-	1/12	-	-	2/10
DIHO	-	-	-	-	-
DITR	-	2/4	-	-	-
EPAN	-	1/8	-	1/12	-
EREA	-	1/8	-	2/12	3/20
ERFL	-	-	-	-	-
ERHE	-	-	1/14	3/6	6/20
ERLA	-	-	-	-	-
ERGR	-	1/4	2/14	2/12	-
FRVEC	6/75	2/20	-	2/18	7/20
FRVIP	4/75	2/41	3/57	2/31	3/20
GALIU	-	-	-	1/25	-
GEVI	-	2/8	-	2/37	-
GETR	-	1/12	1/28	2/25	1/10
GOOB	-	-	-	-	-
GYDR	-	-	-	-	-
HIAL2	2/50	2/62	1/14	1/25	3/20
HIAL	-	2/45	2/28	1/12	-
HYCA	-	-	-	1/6	5/10
LICA3	-	-	-	-	-
LOMAT	-	-	-	2/18	-
LUAR3	-	1/8	5/14	-	-
LUCA	10/50	4/58	3/42	2/37	3/20
MIST2	-	1/4	-	-	-
OSCH	1/25	2/20	-	1/18	1/10
PERA	2/25	-	-	-	-
PENST	15/25	1/4	1/42	2/6	-
PHLOX	-	1/4	-	-	-
POPUC	-	-	-	-	-
POPH	-	-	-	-	-
POMU	-	-	-	-	-
PTAQ	-	-	-	-	-
PYAS	-	1/4	1/14	3/6	-
PYSE	-	1/8	-	-	-
SENEC	-	1/8	1/14	1/12	1/10
SMILA	2/50	1/16	1/14	1/6	-
SMST	-	-	-	-	-
THOC	3/25	1/4	-	1/6	7/30
TITRU	-	3/4	-	-	-
TRCA3	-	-	-	-	-
TRLA2	-	-	-	-	-
VASI	-	-	-	-	-
VECA	-	-	-	1/18	-
VIOLA	-	2/4	-	3/18	-

* Number to the left of slash (/) is % canopy coverage, to the right is % constancy.

APPENDIX C. Mean canopy coverage and constancy* of principal species

SPECIES CODE	PLANT ASSOCIATION OR PLANT COMMUNITY TYPE				
	PIPO/CARU N=16	PIPO/CAGE N=17	PIPO/CELE/ CAGE N=8	PIPO/CELE/ PONE N=7	PIPO/CELE/ FEID-AGSP N=5
Trees					
ABGR	1/18	3/11	1/12	-	-
ABLA2	-	-	-	-	-
JUOC	2/25	4/47	2/87	13/71	10/40
LAOC	1/6	-	-	-	-
PIEN	-	-	-	-	-
PIAL	-	-	-	-	-
PICO	-	-	-	-	-
PIMO	-	-	-	-	-
PIPO	45/100	39/100	37/100	36/100	16/100
POTR2	-	-	-	-	-
PSME	2/56	3/47	2/37	-	2/60
Shrubs					
ACGL	-	-	-	-	-
ALRU	-	-	-	-	-
ALSI	-	-	-	-	-
ARNE	29/12	2/17	3/12	-	-
ARTRV	1/6	1/5	1/12	1/14	7/60
BERE	2/37	2/70	2/87	1/14	1/20
CELE	-	3/17	18/100	17/100	16/100
CHME	-	-	-	-	-
CHUM	-	1/5	-	-	-
CHVI	1/12	1/11	-	-	1/60
COST	-	-	-	-	-
HODI	-	-	-	-	-
LIBO2	-	-	-	-	-
LOIN	-	-	-	-	-
LOUT2	-	-	-	-	-
MEFE	-	-	-	-	-
PAMY	-	-	-	-	-
PHLE2	-	-	-	-	-
PHMA	-	-	-	-	-
PRUNU	-	20/5	1/12	-	-
PUTR	2/18	2/41	3/50	9/100	3/40
RICE	-	3/29	1/37	1/14	2/20
RILA	-	-	-	-	-
RIMO	-	-	-	-	-
RIVI	1/6	1/5	-	-	1/20
ROSA	2/37	-	-	-	-
ROGY	-	-	-	-	-
RUPA	-	-	-	-	-
SASC	-	-	1/12	-	-
SOSI	-	-	-	-	-
SPBE	3/43	2/5	7/12	-	-
SYAL	1/50	2/64	5/37	-	1/60
SYOR	1/6	1/11	-	-	-
TABR	-	-	-	-	-
VAME	-	-	-	-	-
VASC	-	-	-	-	-
Grasses & Grasslike					
AGSP	-	13/41	1/12	-	13/100
BRCA	1/12	1/23	1/25	-	1/20
BRVU	1/6	-	-	-	-
CARU	38/100	3/35	4/25	-	-
CACO	3/37	-	-	-	-
CAGE	20/87	32/100	32/100	-	2/40
CARO	3/31	1/29	-	6/100	2/20
ELGL	-	2/11	-	-	-
FEID	1/12	25/35	1/12	2/57	24/80
FEOC	2/25	3/5	1/12	-	-
KOCR	4/12	5/47	2/25	-	4/20
PONE	2/56	4/70	2/62	12/100	9/20
POSA3	1/12	2/23	-	2/14	13/100

APPENDIX C. (continued)

SPECIES CODE	PLANT ASSOCIATION OR PLANT COMMUNITY TYPE				
	PIPO/CARU	PIPO/CAGE	PIPO/CELE/ CAGE	PIPO/CELE/ PONE	PIPO/CELE/ FEID-AGSP
SIHY	1/6	2/35	1/37	2/71	3/60
STOC	3/25	1/29	2/37	1/71	-
Forbs					
ACMIL	3/81	2/76	2/62	1/14	2/80
ACCO	-	-	-	-	-
ACRU	-	-	-	-	-
ADBI	-	-	-	-	-
AGGL	1/18	1/23	2/37	1/14	2/60
ANPI	-	-	-	-	-
ANRO	2/31	2/29	-	-	-
ANST	-	1/29	2/50	2/28	3/20
AQFO	-	-	-	-	-
ARENA	-	-	-	-	-
ARMA3	-	1/5	1/12	-	-
ARCO	12/56	10/29	2/37	1/14	2/20
ASCA3	-	-	-	-	-
ASCO	-	1/5	-	-	-
ATFI	-	-	-	-	-
BASA	1/12	3/29	-	-	2/40
CLUN	-	-	-	-	-
CREPI	1/6	3/17	-	-	2/20
DIHO	-	-	-	-	-
DITR	-	-	-	-	-
EPAN	1/6	1/11	10/12	-	-
EREA	-	2/35	2/37	-	10/20
ERFL	-	-	-	-	-
ERHE	-	1/5	-	-	2/60
ERLA	-	2/5	-	-	-
ERGR	-	1/5	-	-	-
FRVEC	6/25	2/23	1/12	-	-
FRVIP	2/62	2/41	2/25	-	-
GALIU	2/6	1/5	-	-	-
GEVI	1/25	1/29	-	-	-
GETR	1/25	1/35	-	-	-
GOOB	-	-	-	-	-
GYDR	-	-	-	-	-
HIAL2	2/62	1/52	2/37	1/42	-
HIAL	2/18	2/11	-	-	-
HYCA	-	3/5	-	2/85	-
LICA3	-	-	-	-	-
LOMAT	-	1/11	-	1/71	1/20
LUAR3	-	-	-	-	-
LUCA	3/56	4/41	-	2/28	3/20
MIST2	-	-	-	-	-
OSCH	1/18	-	-	-	-
PERA	-	-	-	-	-
PENST	1/12	3/5	1/12	-	2/40
PHLOX	-	1/11	3/12	1/14	2/40
POPUC	-	-	-	-	-
POPH	-	-	-	-	-
POMU	-	-	-	-	-
PTAQ	-	-	-	-	-
PYAS	-	-	-	-	-
PYSE	-	1/5	-	-	-
SENEC	-	1/35	1/37	3/100	3/20
SMILA	-	1/5	-	-	-
SMST	-	-	-	-	-
THOC	1/6	-	-	-	-
TITRU	-	-	-	-	-
TRCA3	-	-	-	-	-
TRLA2	-	-	-	-	-
VASI	-	-	-	-	-
VECA	-	-	-	-	-
VIOLA	1/6	1/5	-	-	-

APPENDIX C. Mean canopy coverage and constancy* of principal species

SPECIES CODE	PLANT ASSOCIATION OR PLANT COMMUNITY TYPE					
	PIPO/PUTR/ CAGE N=6	PIPO/PUTR/ CARO N=7	PIPO/PUTR/ FEID-AGSP N=3	PIPO/ARTRV/ FEID-AGSP N=6	PIPO/FEID N=16	PIPO/AGSP N=12
Trees						
ABGR	-	-	-	-	-	-
ABLA2	-	-	-	-	-	-
JUOC	-	2/42	2/66	6/83	7/62	3/41
LAOC	-	-	-	-	-	-
PIEN	-	-	-	-	-	-
PIAL	-	-	-	-	-	-
PICO	-	-	-	-	-	-
PIMO	-	-	-	-	-	-
PIPO	42/100	42/100	30/100	17/100	29/100	20/100
POTR2	-	-	-	-	-	-
PSME	3/16	-	-	-	3/12	2/16
Shrubs						
ACGL	-	-	-	-	-	-
ALRU	-	-	-	-	-	-
ALSI	-	-	-	-	-	-
ARNE	-	-	-	-	-	-
ARTRV	-	-	1/33	19/100	4/18	6/16
BERE	2/100	2/57	1/66	2/16	2/43	2/8
CELE	4/50	4/28	-	1/50	3/37	6/16
CHME	-	-	-	-	-	-
CHUM	-	-	-	-	-	-
CHVI	-	1/42	1/66	3/66	2/18	2/16
COST	-	-	-	-	-	-
HODI	-	-	-	-	-	10/8
LIBO2	-	-	-	-	-	-
LOIN	-	-	-	-	-	-
LOUT2	-	-	-	-	-	-
MEFE	-	-	-	-	-	-
PAMY	4/16	-	-	-	-	-
PHLE2	-	-	-	-	-	-
PHMA	-	-	-	-	-	-
PRUNU	1/16	-	-	-	-	1/8
PUTR	13/100	14/100	12/100	6/50	1/62	2/33
RICE	1/33	1/28	-	4/50	1/18	7/8
RILA	-	-	-	-	-	-
RIMO	-	-	-	-	-	-
RIVI	-	-	2/66	-	1/12	1/8
ROSA	5/33	-	2/66	-	1/12	3/16
ROGY	-	-	-	-	-	-
RUPA	-	-	-	-	-	-
SASC	-	-	-	-	-	-
SOSI	-	-	-	-	-	-
SPBE	7/16	-	1/33	-	1/18	3/16
SYAL	3/50	1/14	3/66	2/16	2/18	3/41
SYOR	-	-	-	-	-	-
TABR	-	-	-	-	-	-
VAME	-	-	-	-	-	-
VASC	-	-	-	-	-	-
Grasses & Grasslike						
AGSP	-	2/42	18/66	7/83	9/75	30/100
BRCA	1/16	-	-	-	2/12	-
BRVU	-	-	-	-	-	-
CARU	2/33	-	-	-	2/31	3/8
CACO	-	-	-	-	-	-
CAGE	37/100	3/14	6/33	-	4/50	5/50
CARO	1/66	10/100	1/33	15/16	2/43	4/8
ELGL	-	-	-	-	-	-
FEID	-	1/42	22/100	9/100	29/100	4/66
FEOC	-	-	-	-	-	-
KOCR	1/16	1/85	2/66	-	2/43	5/16
PONE	2/33	4/71	4/66	20/16	5/43	4/25
POSA3	1/16	2/85	1/66	11/83	4/56	6/83

APPENDIX C. (continued)

SPECIES CODE	PLANT ASSOCIATION OR PLANT COMMUNITY TYPE					
	PIPO/PUTR/ CAGE	PIPO/PUTR/ CARO	PIPO/PUTR/ FEID-AGSP	PIPO/ARTRV/ FEID-AGSP	PIPO/FEID	PIPO/AGSP
SIHY	1/50	4/100	1/66	5/33	2/56	2/25
STOC	1/33	1/100	1/33	-	2/25	3/8
Forbs						
ACMIL	2/83	1/100	2/100	3/66	3/93	4/75
ACCO	-	-	-	-	-	-
ACRU	-	-	-	-	-	-
ADBI	-	-	-	-	-	-
AGGL	1/16	1/28	-	3/16	1/37	1/8
ANPI	-	-	-	-	-	-
ANRO	1/16	2/28	2/66	-	-	2/16
ANST	1/50	2/71	2/33	2/66	2/25	4/16
AQFO	-	-	-	-	-	-
ARENA	-	-	-	-	-	-
ARMA3	-	1/14	-	-	-	-
ARCO	1/16	-	-	-	1/18	-
ASCA3	-	-	-	-	-	-
ASCO	-	-	-	-	-	-
ATFI	-	-	-	-	-	-
BASA	2/33	-	1/33	1/16	1/12	2/25
CLUN	-	-	-	-	-	-
CREPI	-	-	-	-	1/43	1/16
DIHO	-	-	-	-	-	-
DITR	-	-	-	-	-	-
EPAN	1/33	-	-	-	-	1/8
EREA	-	1/14	5/66	7/16	2/37	2/33
ERFL	-	-	-	1/16	-	-
ERHE	-	2/28	1/33	1/66	2/18	1/41
ERLA	6/33	1/57	-	1/16	1/12	1/8
ERGR	-	-	-	-	-	-
FRVEC	1/33	-	-	-	-	-
FRVIP	1/16	1/42	1/33	-	1/18	-
GALIU	-	-	-	-	-	-
GEVI	-	-	-	-	1/12	-
GETR	-	-	1/33	-	3/37	3/8
GOOB	-	-	-	-	-	-
GYDR	-	-	-	-	-	-
HIAL2	2/50	1/14	1/33	1/16	2/43	1/41
HIAL	-	-	-	-	-	-
HYCA	-	-	-	3/16	1/6	-
LICA3	-	-	-	-	-	-
LOMAT	-	-	-	4/50	1/25	3/33
LUAR3	-	-	-	-	-	-
LUCA	3/50	5/28	1/33	3/16	4/37	10/33
MIST2	-	-	1/33	-	-	-
OSCH	-	-	-	-	-	-
PERA	-	-	-	-	-	-
PENST	1/16	-	-	2/16	1/6	2/16
PHLOX	-	2/14	-	2/50	3/18	2/16
POPUC	-	-	-	-	-	-
POPH	-	-	-	-	-	-
POMU	-	-	-	-	-	-
PTAQ	-	-	-	-	-	-
PYAS	-	-	-	-	-	-
PYSE	-	-	-	-	-	-
SENEC	1/33	1/71	1/33	3/83	1/18	2/8
SMILA	-	-	-	-	-	-
SMST	-	-	-	-	-	-
THOC	-	-	-	-	-	-
TITRU	-	-	-	-	-	-
TRCA3	-	-	-	-	-	-
TRLA2	-	-	-	-	-	-
VASI	-	-	-	-	-	-
VECA	-	-	-	-	-	-
VIOLA	-	-	-	2/16	-	-

APPENDIX C. Mean canopy coverage and constancy* of principal species

SPECIES CODE	PLANT ASSOCIATION OR PLANT COMMUNITY TYPE			
	JUOC/PUTR/ FEID-AGSP N=4	*JUOC/FEID- AGSP* N=7	PHMA-SYAL N=5	*CELE/FEID- AGSP* N=4
Trees				
JUOC	11/100	18/100	-	3/25
PIPO	5/25	2/57	3/40	2/75
PSME	-	-	1/40	1/25
Shrubs				
ACGL	-	-	2/60	-
AMAL	-	-	3/100	-
ARAR	7/50	1/14	-	-
ARTRV	2/50	-	-	3/25
CELE	1/25	5/14	-	34/100
HODI	-	-	17/80	-
PHLE2	-	-	2/40	-
PHMA	-	-	51/100	-
PRUNU	-	-	22/40	-
PUTR	18/100	2/28	-	-
RICE	-	2/42	-	-
ROSA	-	-	7/60	-
SASC	-	-	4/40	-
SPBE	-	-	10/80	-
SYAL	1/25	5/14	16/100	3/75
Grasses & Grasslike				
AGSP	8/100	15/100	11/100	18/100
BRCA	1/25	1/14	-	1/50
BRTE	3/25	5/42	-	40/25
CAGE	-	-	8/60	4/50
DAUN	-	7/42	-	-
FEID	25/100	26/85	2/20	12/50
KOCR	3/25	4/42	2/20	6/50
PONE	-	1/14	-	21/75
POPR	-	-	5/20	7/25
POSA3	10/100	5/85	2/20	3/75
STOC	-	1/14	-	3/50
Forbs				
ACMIL	6/100	3/85	2/60	3/75
AGGL	1/50	-	-	1/25
ANDI	1/50	1/14	-	1/25
BASA	1/25	4/57	3/20	-
BRODI	-	1/42	-	-
CREPI	1/25	1/14	1/20	1/50
ERHE	5/25	4/28	-	2/75
GALIU	-	1/14	1/40	-
GEVI	-	-	-	1/25
GETR	1/50	6/28	1/40	-
LOMAT	1/75	1/57	-	2/25
LUCA	10/25	4/57	2/20	-
PHLOX	3/75	10/14	-	-
POGL	-	-	-	1/25
SELA2	-	2/14	7/20	8/50
SENEC	2/50	1/28	-	1/25
TRDU	1/50	1/14	-	-

* *Number to the left of slash (/) is % canopy coverage, to the right is % constancy.*

APPENDIX C. Mean canopy coverage and constancy* of principal species

SPECIES CODE	PLANT ASSOCIATION OR PLANT COMMUNITY TYPE				
	ARTRV/CAGE N=13	ARTRV/FEID-AGSP N=15	ARAR/FEID-AGSP N-17	ARAR/POSA3 N=4	ARRI/POSA3 N=23
Trees					
ABGR	1/7	-	-	-	-
JUOC	3/15	2/46	2/47	2/25	3/17
PIAL	7/7	-	-	-	-
PIPO	2/27	7/6	2/5	-	1/13
PSME	5/38	-	-	-	-
Shrubs					
ARTRV	18/100	16/100	-	-	-
ARAR	-	-	20/100	18/100	2/13
ARRI	-	-	1/11	-	14/100
CHVI	-	1/86	-	-	-
PUTR	-	2/60	3/64	-	1/8
ROSA	-	1/33	-	-	-
SYAL	2/38	1/6	-	-	-
TECA	-	1/33	-	-	-
Grasses & Grasslike					
AGSP	2/15	18/86	17/76	2/50	4/30
BRCA	3/38	-	-	1/25	-
CAGE	40/100	-	-	1/25	-
DAUN	1/7	-	2/47	1/25	3/65
FEID	20/7	21/93	16/76	2/75	2/26
KOCR	2/23	5/93	1/52	-	3/4
POSA3	2/15	11/86	10/100	18/100	17/100
SIHY	1/15	2/80	1/41	1/25	-
SIHYH	-	-	1/23	5/50	2/73
STOC	4/69	2/26	-	-	2/17
Forbs					
ACMIL	2/92	2/86	2/52	2/25	1/30
AGGL	1/7	1/13	2/35	-	2/14
ALAC	-	1/13	2/35	1/25	3/39
ANDI	1/7	-	1/41	1/25	2/47
ANRO	3/15	2/40	2/11	-	-
ARENA	7/46	-	1/11	2/75	2/8
BASE	-	-	1/41	-	3/21
CREPI	1/23	1/60	1/29	-	1/4
ERBL	-	1/6	2/41	2/50	1/13
EREA	2/7	3/66	2/5	-	-
ERFL	4/76	-	1/5	-	-
ERHE	6/23	4/93	2/17	1/25	2/26
ERUM	-	1/40	1/17	-	3/4
ERLA	-	1/6	-	-	-
HALA	7/7	1/13	1/29	-	2/26
GETR	1/7	1/26	-	-	-
HIAL2	4/84	1/6	-	-	-
LOMAT	2/23	1/6	2/52	1/25	4/56
LOGO	-	-	-	-	5/17
LUCA	14/23	4/46	6/11	-	2/4
MITR	-	-	2/29	2/25	2/78
PENST	5/23	1/26	-	1/50	1/8
PHLOX	14/38	4/66	5/70	2/50	4/39
SELA2	-	-	1/17	2/25	3/43
SIDO	1/7	-	1/23	-	2/39
TRMA	-	-	2/47	2/50	9/60

* Number to the left of slash (/) is % canopy coverage, to the right is % constancy.

APPENDIX C. Mean canopy coverage and constancy* of principal species

SPECIES CODE	PLANT ASSOCIATION OR PLANT COMMUNITY TYPE				
	PUTR/FEID-AGSP N=3	FEID (subalpine) N=4	FEID-AGSP N=28	AGSP-POSA3 N=29	POSA3-DAUN N=10
Trees					
ABGR	-	-	-	-	-
JUOC	2/66	-	1/7	4/6	-
PIAL	-	2/25	-	-	-
PIPO	4/66	-	1/3	1/6	7/20
PSME	-	-	-	1/6	-
Shrubs					
ARTRV	9/33	1/25	1/3	2/10	2/10
ARAR	2/33	-	4/10	2/10	-
ARRI	-	-	3/14	-	-
CHVI	1/33	-	1/10	1/6	-
PUTR	13/100	-	3/10	2/13	-
ROSA	-	-	1/3	1/3	-
SYAL	-	1/25	3/14	3/24	-
TECA	-	-	-	-	-
Grasses & Grasslike					
AGSP	22/100	6/50	17/89	29/100	5/10
BRCA	3/33	-	1/10	1/10	-
CAGE	9/33	1/25	-	4/10	-
DAUN	7/66	-	2/17	4/10	17/60
FEID	7/100	43/100	23/100	3/31	3/10
KOCR	2/66	2/25	5/42	6/31	1/10
POSA3	14/100	10/75	12/82	10/96	17/100
SIHY	2/66	2/25	1/7	1/13	-
SIHYH	-	-	-	-	2/40
STOC	-	-	-	6/6	5/20
Forbs					
ACMIL	5/100	4/100	3/89	3/79	3/80
AGGL	1/33	-	2/25	1/17	1/10
ALAC	1/33	-	1/7	1/13	3/20
ANDI	-	3/25	3/25	2/27	5/70
ANRO	2/66	1/25	1/14	-	-
ARENA	2/66	2/25	1/7	1/3	5/10
BASE	-	1/25	4/28	2/24	6/50
CREPI	1/33	1/50	1/32	1/17	1/10
ERBL	-	2/25	1/21	1/3	-
EREA	5/66	3/25	2/17	1/10	-
ERFL	-	1/50	1/7	2/10	-
ERHE	1/33	13/50	8/53	4/55	3/10
ERUM	-	1/25	2/10	1/3	-
ERLA	-	1/50	1/10	-	-
HALA	-	-	1/14	1/6	-
GETR	1/33	15/50	4/25	-	2/10
HIAL2	-	-	1/10	2/6	-
LOMAT	1/33	2/25	3/39	3/48	29/10
LOGO	-	-	3/10	2/6	4/70
LUCA	-	1/50	3/21	4/17	-
MITR	-	-	1/3	3/13	1/20
PENST	1/33	2/75	2/10	2/24	3/10
PHLOX	2/66	15/25	5/35	7/10	-
SELA2	1/33	2/50	3/25	2/27	2/50
SIDO	-	-	1/10	1/10	4/40
TRMA	-	-	6/10	6/17	17/30

* Number to the left of slash (/) is % canopy coverage, to the right is % constancy.

APPENDIX D - FOREST PRODUCTIVITY TABLE (Continued)

	PICO SERIES	PSME SERIES						PIPO SERIES												
Species	PICO/ CARU	PSME/ PHMA	PSME/ HODI	PSME/ SYAL	PSME/ VAME	PSME/ CARU	PSME/ CAGE	PIPO/ SYAL	PIPO/ SYOR	PIPO/ CARU	PIPO/ CAGE	PIPO/ CELE/ CAGE	PIPO/ CELE/ PONE	PIPO/ CELE/ FEID-AGSP	PIPO/ PUTR/ CAGE	PIPO/ PUTR/ CARO	PIPO/ PUTR/ FEID-AGSP	PIPO/ ARTRV/ FEID-AGSP	PIPO/ FEID	PIPO/ AGSP
PIPO * SI	--	88	107	83	78	75	68	94	80	71	70	65	61	51	64	67	65	81	62	59
**GBA	--	125	181	119	80	106	83	154	110	141	77	84	55	48	73	90	67	81	68	45
*** PI	--	47	84	43	25	33	23	70	39	41	24	23	15	11	20	28	18	29	18	13
PSME SI	--	88	117	89	79	81	71	--	--	--	--	--	--	--	--	--	--	--	--	--
GBA	--	124	190	138	90	133	123	--	--	--	--	--	--	--	--	--	--	--	--	--
PI	--	50	96	56	28	46	36	--	--	--	--	--	--	--	--	--	--	--	--	--
LAOC SI	--	97	--	98	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
GBA	--	115	--	93	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PI	--	49	--	42	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PICO SI	73	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
GBA	132	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PI	42	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PIMO SI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
GBA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PIEN SI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
GBA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ABGR SI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
GBA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ABLA2 SI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
GBA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

* Site Index (Base = 100 yrs.)

APPENDIX D - FOREST PRODUCTIVITY TABLE

		ABLA2 SERIES							ABGR SERIES													
		ABLA2/ TRCA3	ABLA2/ CLUN	ABLA2/ LIBO2	ABLA MEFE	ABLA2/ VAME	ABLA2/ VASC	ABLA2 CAGE	ABGR/ GYDR	ABGR/ POMU-ASCA3	ABGR/ TRCA3	ABGR/ ACGL	ABGR/ TABR/ CLUN	ABGR/ TABR/ LIBO2	ABGR/ CLUN	ABGR/ LIBO2	ABGR/ VAME	ABGR/ VASC-LIBO2/	ABGR/ VASC	ABGR/ SPBE	ABGR/ CARU	ABGR/ CAGE	ABGR/ BRVU
pecies																							
IPO *	SI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	73	76	--	86	85	77	80	--
**GBA		--	--	--	--	--	--	--	--	--	--	--	--	--	--	271	119	--	77	113	130	89	--
*** PI		--	--	--	--	--	--	--	--	--	--	--	--	--	--	79	38	--	29	41	42	33	--
SME	SI	--	--	--	--	--	73	--	--	--	--	114	--	78	87	64	71	78	78	116	80	79	--
	GBA	--	--	--	--	--	165	--	--	--	--	175	--	239	247	172	177	168	133	146	178	148	--
	PI	--	--	--	--	--	56	--	--	--	--	91	--	83	92	47	53	51	41	76	60	51	--
AOC	SI	--	104	83	--	65	66	--	--	124	110	106	--	96	117	88	75	93	77	--	93	--	81
	GBA	--	224	181	--	116	117	--	--	200	202	172	--	134	247	151	162	109	109	--	132	--	167
	PI	--	107	66	--	31	30	--	--	110	94	75	--	58	126	53	55	44	32	--	52	--	53
ICO	SI	85	--	--	--	65	61	69	--	--	--	--	--	--	--	73	67	66	71	--	74	--	--
	GBA	230	--	--	--	107	127	172	--	--	--	--	--	--	--	199	102	140	133	--	142	--	--
	PI	82	--	--	--	30	30	48	--	--	--	--	--	--	--	61	28	37	40	--	45	--	--
IMO	SI	--	--	--	--	--	--	--	--	--	--	--	--	97	--	104	--	--	--	--	--	--	--
	GBA	--	--	--	--	--	--	--	--	--	--	--	--	222	--	212	--	--	--	--	--	--	--
	PI	--	--	--	--	--	--	--	--	--	--	--	--	80	--	93	--	--	--	--	--	--	--
IEN	SI	101	87	83	--	61	76	--	--	107	108	96	100	101	104	81	88	85	--	--	--	--	60
	GBA	193	329	192	--	168	178	--	--	423	226	177	238	168	282	200	178	179	--	--	--	--	258
	PI	81	127	69	--	49	57	--	--	192	107	75	100	64	119	71	69	65	--	--	--	--	63
BGR	SI	--	--	--	--	--	--	--	121	107	108	111	104	83	101	77	71	81	75	118	87	75	80
	GBA	--	--	--	--	--	--	--	298	243	279	236	279	283	308	216	183	212	152	188	198	233	260
	PI	--	--	--	--	--	--	--	153	116	128	118	124	102	141	70	56	74	41	99	76	90	88
BLA2	SI	96	84	79	89	55	66	70	--	--	--	--	--	--	--	84	79	103	--	--	--	--	--
	GBA	207	308	166	248	114	168	175	--	--	--	--	--	--	--	190	204	103	--	--	--	--	--
	PI	90	117	54	93	26	44	51	--	--	--	--	--	--	--	63	71	47	--	--	--	--	--

* Site Index (Base = 100 yrs.)

APPENDIX E. Forest Productivity Classes

CLASSES*				
LOW	MODERATE	MOD. HIGH	HIGH	VERY HIGH
PIPO/CELE/ PONE	ABLA2/MEFE	ABLA2/TRCA3	ABLA2/CLUN	ABGR/GYDR
PIPO/CELE/ FEID-AGSP	ABLA2/VAME	ABLA2/LIBO2	ABGR/TRCA3	ABGR/POMU-ASCA3
PIPO/PUTR/ FEID-AGSP	ABLA2/VASC	ABGR/TABR-LIBO2	ABGR/TABR/ CLUN	ABGR/CLUN
PIPO/FEID	ABLA2/CAGE	ABGR/LIBO2	ABGR/ACGL	
PIPO/AGSP	ABGR/VASC	ABGR/VAME	PSME/HODI	
	PICO/CARU	ABGR/VASC-LIBO2		
	PSME/PHMA	ABGR/BRVU		
	PSME/SYAL	ABGR/SPBE		
	PSME/VAME	ABGR/CARU		
	PSME/CARU	ABGR/CAGE		
	PSME/CAGE	PIPO/SYAL		
	PIPO/SYOR			
	PIPO/CARU			
	PIPO/CAGE			
	PIPO/CELE/ CAGE			
	PIPO/PUTR/ CAGE			
	PIPO/PUTR/ CARO			
	PIPO/ARTRV/ FEID-AGSP			

* LOW = <20 CU FT/AC/YR
MODERATE = 20-50 CU FT/AC/YR
MOD. HIGH = 51-85 CU FT/AC/YR
HIGH = 86-120 CU FT/AC/YR

APPENDIX F. Cross Reference Listing of Plant Associations

Blue Mountain Classification (Hall 1973)	Blue-Ochoco Classification (Johnson and Clausnitzer - 1991)
ABLA2-PIAL/CAGE	ABLA2/CAGE
POPH (Subalpine)	ABLA2-PIAL/POPH
ARTRV (Subalpine)	ARTRV/CAGE
FEID (Subalpine)	FEID (Subalpine)
CAGE (Subalpine)	CAGE (Subalpine)
ABLA2/VASC	ABLA2/VASC ABLA2/LIBO2
ABLA2/VAME	ABLA2/VAME ABLA2/CLUN ABLA2/TRCA3
ABGR/VASC	ABGR/VASC ABGR/VASC-LIBO2
ABGR/VAME	ABGR/VAME ABGR/LIBO2 ABGR/CLUN ABGR/ACGL
ABGR/LIBO2	ABGR/LIBO2 ABGR/TRCA3 ABGR/TABR/LIBO2 ABGR/TABR/CLUN
PICO/VASC	PICO(ABLA2)/VASC PICO(ABGR)/VASC/CARU
PICO/VAME	PICO(ABLA2)/VAME PICO(ABLA2)/VAME/CARU PICO(ABGR)/VAME PICO(ABGR)/VAME/CARU PICO(ABGR)/VAME-LIBO2 PICO(ABGR)/CARU
PICO/VASC/CARU	PICO(ABGR)/VASC/CARU PICO(ABGR)/CARU

Blue Mountain Classification (Hall 1973)	Blue-Ochoco Classification (Johnson and Clausnitzer - 1991)
PIPO-PSME/SYAL-HODI	PSME/HODI
PIPO-PSME/PHMA	PSME/PHMA
MIX CONIFER/CARU (RES)	ABGR/CAGE ABGR/SPBE PSME/SYAL PSME/CAGE PIPO/CAGE PIPO/SYAL
MIX CONIFER/CARU (ASH)	PSME/CARU ABGR/ARCO ABGR/CARU ABGR/SPBE PIPO/CARU
PIPO-PSME/CAGE	PSME/CAGE PIPO/SYAL
PIPO/ELGL	Not Classified
PIPO/PUTR/CARO	PIPO/PUTR/CARO
PIPO/FEID	PIPO/FEID
PIPO/AGSP	PIPO/AGSP
ALTE	ALSI
PHMA	PHMA-SYAL
SYAL	SYAL
CELE	CELE/FEID-AGSP
PUTR/AGSP-FEID	PUTR/FEID-AGSP
JUOC/ARTRV	JUOC/ARTRV
JUOC/ARAR	JUOC/ARAR
JUOC/ARRI	JUOC/ARRI
JUOC/AGSP-FEID	JUOC/FEID-AGSP

Blue Mountain Classification (Hall 1973)	Blue-Ochoco Classification (Johnson and Clausnitzer - 1991)
ARTRV/AGSP-FEID	ARTRV/FEID-AGSP
ARAR/AGSP-FEID	ARAR/FEID-AGSP ARAR/POSA3
ARRI/POSA3	ARRI/POSA3
AGSP-FEID (deep, steep)	FEID-AGSP AGSP-POSA3
AGSP-FEID (shallow, steep)	FEID-AGSP AGSP-POSA3
AGSP-FEID (deep, gentle)	FEID-AGSP AGSP-POSA3
AGSP-FEID (shallow, gentle)	FEID-AGSP AGSP-POSA3 AGSP-POSA3-DAUN
POSA3 SCAB	POSA3-DAUN
PIPO/ELGL	Not Classified
ASPEN	Not Classified
WET MDW	Not Classified
MOIST MDW	Not Classified
DRY MDW	Not Classified

Appendix G. Range Condition Standards/Plant Associations Cross-Reference

Standard		Plant Association	
R6-2210-23	AGROPYRON-FESTUCA	GB59	FEID-AGSP
		GB41	AGSP-POSA3
		CJG111	JUOC/FEID-AGSP
		CJS4	JUOC/CELE/FEID-AGSP comm.
		CJS321	JUOC/PUTR/FEID-AGSP
		SD3111	PUTR/FEID-AGSP
		CPS234	PIPO/CELE/FEID-AGSP
		CPS226	PIPO/PUTR/FEID-AGSP
		SD4111	CELE/FEID-AGSP
R6-2210-25	PIPO/PUTR/CARO	CPS221	PIPO/PUTR/CARO
R6-2210-29	ALPINE OPENINGS	SS49	CAGE pct.
		GS11	FEVI comm.
		GS1211	FEID comm.
		GS10	STOC comm.
		SS4911	ARTRV/CAGE
		SS49	ARTRV/BRCA pct.
R6-2210-44	PIPO/CARU-CAGE	CPG221	PIPO/CARU
		CPG222	PIPO/CAGE
R6-2210-49	SHRUB & NONSHRUB SCABLANDS	SD9111	ARRI/POSA3
		GB9111	POSA3-DAUN
		GB4911	AGSP-POSA3-DAUN pct.
		CJS8	JUOC/ARRI comm.
R6-2210-51	PIPO/FEID-AGSP	CPG112	PIPO/FEID
		CPG111	PIPO/AGSP
R6-2210-52	ARTEM/AGSP-FEID	SD2911	ARTRV/FEID-AGSP
		SD1911	ARAR/FEID-AGSP
		SD9221	ARAR/POSA3
		CJS1	JUOC/ARAR comm.
		CJ2511	JUOC/ARTRV/FEID-AGSP comm.
		CPS131	PIPO/ARTRV/FEID-AGSP
		CPS1	PIPO/ARAR comm.
R6-2210-53	MIXED CONIFER/CARU-CAGE	CWG113	ABGR/CARU
		CWG111	ABGR/CAGE
		CWS322	ABGR/SPBE
		CWG1	ABGR/ARCO pct.
		CLS5	PICO(ABGR)/VAME/CARU pct.
		CDS624	PSME/SYAL
		CDS623	PSME/SYOR
		CDG112	PSME/CARU
		CDG111	PSME/CAGE
		CDSD	PSME/CELE/CAGE pct.
		CPS524	PIPO/SYAL
		CPS525	PIPO/SYOR
		CPG221	PIPO/CARU
		CPG222	PIPO/CAGE
		CPS232	PIPO/CELE/CAGE
		CPS222	PIPO/PUTR/CAGE
		CPS1	PIPO/ARTRV/CAGE comm.
		CPS1	PIPO/PERA3 comm.
		SM31	SYAL comm.
		SM32	SYOR comm.
		CD40	CELE/CAGE comm.
		CJS4	JUOC/CELE/CAGE comm.

The following standards are unusable with this classification. The vegetation exemplified in wetlands will be addressed i forthcoming wetlands community type classification.

R6-2210-C7	Mountain Meadow Type	NOT CLASSIFIED
R6-2210-24	PIPO/ELGL	NOT CLASSIFIED

APPENDIX H. ECOCLASS CODE LISTING

Seral plant community types (i.e. - PICO) were tentatively given 4-digit codes. A new Ecoclass Seral Stage coding system will be devised during the winter of 1991-92. Certain vegetation not sufficiently represented due to sample size was either given 4-digit codes or no codes.

	1973 (Blues)	1987 Wallowa-Snake	1991 (Blue-Ochoco)
SUBALPINE FIR SERIES			
ABLA2/TRCA3	--	--	CEF331
ABLA2/CLUN	--	CES131	CES314
ABLA2/LIBO2	--	CEF221	CES414
ABLA2/VAME	CES311	CES315	CES311
PICO(ABLA2)/VAME pct	--	CLS515	CLS5
PICO(ABLA2)/VAME/CARU pct	--	--	CLS5
ABLA2/ARCO pct	--	--	No Code
ABLA2/VASC	CES411	--	CES411
PICO(ABLA2)/VASC pct	CLS411	--	CLS4
ABLA2/CAGE	CAG1	--	CAG111
PICO(ABLA2)/CAGE comm.	--	--	No Code
ABLA2/STOC pct	--	--	CAG4
PICO(ABLA2)/STOC comm.	--	--	No Code
ABLA2/MEFE	--	CES221	CES221
ABLA2/RHAL comm.	--	--	No Code
ABLA2-PIAL/POPH comm.	--	--	CAF2
ABLA2-PIAL/JUDR comm.	--	--	CAG3
ABLA2-PIAL/POPU comm.	--	--	CAF0
GRAND FIR SERIES			
ABGR/GYDR	--	--	CWF611
ABGR/POMU-ASCA3	--	--	CWF612
ABGR/TRCA3	--	--	CWF512
ABGR/ACGL	--	CWS912	CWS541
ABGR/TABR/CLUN	--	CWF422	CWC811
ABGR/TABR/LIBO2	--	--	CWC812
ABGR/CLUN	--	CWF421	CWF421
ABGR/LIBO2	CWF311	CWF311	CWF312
PICO(ABGR)/VAME-LIBO2 pct	--	CLF211	CLS5
ABGR/VAME	CWS211	CWS211	CWS212
PICO(ABGR)/VAME pct	CLS511	--	CLS5
PICO(ABGR)/VAME/CARU pct	--	--	CLS5
PICO(ABGR)/VAME/PTAQ comm.	--	--	CLS5
ABGR/VASC-LIBO2	--	--	CWS812

	1973 (Blues)	1987 Wallowa-Snake	1991 (Blue-Ochoco)
ABGR/VASC	--	--	CWS811
PICO(ABGR)/VASC/CARU pct	CLG211	--	CLS4
ABGR/SPBE	--	CWS321	CWS322
ABGR/CARU	CWG112	CWG112	CWG113
PICO(ABGR)/CARU pct	--	--	CLG2
ABGR/ARCO pct	--	--	No Code
ABGR/CAGE	CWG111	--	CWG111
ABGR/BRVU	--	--	CWG211
PICO(ABGR)/ARNE comm.	--	--	No Code
PICO(ABGR)/ALSI comm.	--	--	CLS6
ABGR-CHNO/VAME comm.	--	--	No Code
LODGEPOLE PINE SERIES			
PICO/CARU	--	--	CLS416
DOUGLAS-FIR SERIES			
PSME/PHMA	CDS711	CDS711	CDS711
PSME/HODI	CDS611	--	CDS611
PSME/SYAL	--	CDS622	CDS624
PSME/VAME	--	CDS812	CDS821
PSME/SYOR	--	CDS623	CDS625
PSME/CARU	--	CDG121	CDG112
PSME/CAGE	CDG111	--	CDG111
PSME/CELE/CAGE pct	--	--	CDSD
PONDEROSA PINE SERIES			
PIPO/SYAL	--	CPS522	CPS524
PIPO/SYOR	--	--	CPS525
PIPO/CARU	--	--	CPG221
PIPO/CAGE	--	--	CPG222
PIPO/CELE/CAGE	--	--	CPS232
PIPO/CELE/PONE	--	--	CPS233
PIPO/CELE/FEID-AGSP	--	--	CPS234
PIPO/PUTR/CAGE	--	--	CPS222
PIPO/PUTR/CARO	CPS221	--	CPS221
PIPO/ARTRV/FEID-AGSP	--	--	CPS131
PIPO/FEID	CPG112	CPG131	CPG112
PIPO/AGSP	CPG111	CPG132	CPG111
PIPO/PUTR/FEID-AGSP	--	--	CPS226
PIPO/ARTRV/CAGE comm.	--	--	CPS1

	1973 (Blues)	1987 Wallowa-Snake	1991 (Blue-Ochoco)
PIPO/PERA3 comm.	--	--	CPS1
PIPO/ARAR comm.	--	--	CPS1
PIPO/RHGL comm.	--	--	No Code
SHRUBLANDS			
ARTRV/CAGE	SS4911	SD2915	SS4911
ARTRV/BRCA pct	--	--	No Code
ARTRV/FEID-AGSP	SD2911	SD2911	SD2911
ARAR/FEID-AGSP	SD1911	--	SD1911
ARAR/POSA3	--	--	SD9221
CELE/FEID-AGSP	--	SD49	SD4111
ARRI/POSA3	SD9111	SD9111	SD9111
PHMA-SYAL	SM19	SM19	SM1111
PUTR/FEID-AGSP	SD39	SD3111	SD3111
ALSI comm.	--	--	SM20
CEVE comm.	--	--	No Code
SYAL comm.	SM31	SM3111	SM31
SYOR comm.	--	SM32	SM32
CELE/CAGE comm.	--	SD49	SD40
JUNIPER WOODLANDS			
JUOC/PUTR/FEID-AGSP	--	--	CJS321
JUOC/FEID-AGSP	CJG111	CJG111	CJG111
JUOC/CELE/CAGE comm.	--	--	CJS4
JUOC/CELE/FEID-AGSP comm.	--	--	CJS4
JUOC/ARTRV/FEID-AGSP comm.	CJS211	--	CJS2
JUOC/ARAR comm.	CJS111	--	CJS1
JUOC/ARRI comm.	CJS811	--	CJS8
GRASSLANDS			
FEID-AGSP	--	--	GB59
AGSP-POSA3	--	--	GB41
POSA3-DAUN	GB9111	GB9111	GB9111
AGSP-POSA3-DAUN pct	--	GB4911	GB4911
CAGE (subalpine) pct	GS3911	--	No Code
FEVI (subalpine) comm.	--	GS11	GS11
FEID (subalpine) comm.	GS1211	--	GS12
CAHO (subalpine) comm.	--	--	No Code
STOC (subalpine) comm.	--	--	GS10